UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended: December 31, 2021

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to .

Commission File No.: 001-34705

Codexis, Inc.

(Exact name of registrant as specified in its charter)

Delaware	71-0872999
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
200 Penobscot Drive, Redwood City, California	94063
(Address of principal executive offices)	(Zip Code)

Registrant's telephone number, including area code: (650) 421-8100

Securities Registered Pursuant to Section 12(b) of the A:

Title of Each Class:	Trading Symbols(s):	Name of Each Exchange on which Registered:
Common Stock, par value $0.0001 per share	CDXS	The Nasdaq Global Select Market

Securities Registered Pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.	Yes	☒	No	☐
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act.	Yes	☐	No	☒
Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.	Yes	☒	No	☐
Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).	Yes	☒	No	☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or emerging growth company. See the definitions of "large accelerated filer, "accelerated filer" and "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act:

Large accelerated filer	☒	Accelerated filer	☐	☐
Non-accelerated filer	☐	Smaller reporting company	☐	
		Emerging growth company	☐	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C.7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒	Yes	☒	No	☐
Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act).	Yes	☐	No	☒

The aggregate market value of voting and non-voting common stock held by non-affiliates of Codexis as of June 30, 2021 was approximately $737.5 million based upon the closing price reported for such date on the Nasdaq Global Select Market.

As of February 24, 2022, there were 65,160,679 shares of the registrant's Common Stock, par value $0.0001 per share, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Definitive Proxy Statement to be filed with the Commission pursuant to Regulation 14A in connection with the registrant's 2022 Annual Meeting of Stockholders (the "Proxy Statement"), to be filed subsequent to the date hereof, are incorporated by reference into Part III of this Report. Such Definitive Proxy Statement will be filed with the Securities and Exchange Commission not later than 120 days after the conclusion of the registrant's fiscal year ended December 31, 2021. Except with respect to information specifically incorporated by reference in this Form 10-K, the Proxy Statement is not deemed to be filed as part of this Form 10-K.

Codexis, Inc.
Annual Report on Form 10-K
For The Year Ended December 31, 2021

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

The following discussion and analysis should be read in conjunction with our audited Consolidated Financial Statements and the related Notes that appear elsewhere in this Annual Report on Form 10-K. This Annual Report on Form 10-K contains "forward-looking statements" within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended ("the Exchange Act"), particularly in Part I, Item 1: "Business," Part I, Item 1A: "Risk Factors" and Part 2, Item 7: "Management's Discussion and Analysis of Financial Condition and Results of Operations." These statements are often identified by the use of words such as "may," "will," "expect," "believe," "anticipate," "intend," "could," "should," "estimate" or "continue," and similar expressions or variations. All statements other than statements of historical fact could be deemed forward-looking, including, but not limited to: any projections of financial information or performance; any statements about historical results that may suggest trends for our business; any statements of the plans, strategies, and objectives of management for future operations; any statements of expectation or belief regarding future events, technology developments, our products and product candidates, product sales, revenues, expenses, liquidity, cash flow, market growth rates or enforceability of our intellectual property rights and related litigation expenses; and any statements of assumptions underlying any of the foregoing. Such forward-looking statements are subject to risks, uncertainties and other factors that could cause actual results and the timing of certain events to differ materially from future results expressed or implied by such forward-looking statements. Accordingly, we caution you not to place undue reliance on these statements. For a discussion of some of the factors that could cause actual results to differ materially from our forward-looking statements, see the discussion on risk factors that appear in Part I, Item 1A: "Risk Factors" of this Annual Report on Form 10-K and other risks and uncertainties detailed in this and our other reports and filings with the Securities and Exchange Commission ("SEC"). The forward-looking statements in this Annual Report on Form 10-K represent our views as of the date of this Annual Report on Form 10-K. We anticipate that subsequent events and developments will cause our views to change. However, while we may elect to update these forward-looking statements at some point in the future, we have no current intention of doing so except to the extent required by applicable law. You should, therefore, not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this Annual Report on Form 10-K.

PART I

ITEM 1. BUSINESS

COMPANY OVERVIEW

We discover, develop and sell enzymes and other proteins that deliver value to our clients in a growing set of industries. We view proteins as a vast, largely untapped source of value-creating products, and we are using our proven technologies, which we have been continuously improving since our inception in 2002, to commercialize an increasing number of novel enzymes, both as proprietary Codexis products and in partnership with our customers.

We are a pioneer in harnessing computational technologies to drive biology advancements. Since 2002, we have made substantial investments in the development of our CodeEvolver® protein engineering technology platform, the primary source of our competitive advantage. Our technology platform is powered by proprietary, artificial intelligence-based, computational algorithms that rapidly mine the structural and performance attributes of our large and continuously growing library of protein variants. These computational outputs enable increasingly reliable predictions for next generation protein variants to be engineered, enabling time- and cost-efficient delivery of the targeted performance enhancements. In addition to its computational prowess, our CodeEvolver® protein engineering technology platform integrates additional modular competencies, including robotic high-throughput screening and genomic sequencing, organic chemistry and bioprocess development which are all coordinated to rapidly innovate novel, fit-for-purpose products.

The core historical application of the technology has been in developing commercially viable biocatalytic manufacturing processes for more sustainable production of complex chemicals. It begins by conceptually designing the most cost-effective and practical process for a targeted product. We then develop optimized biocatalysts to enable the designed process, using our CodeEvolver® platform. Engineered biocatalyst candidates, numbering many thousands for each project, are then rapidly screened and validated using high throughput methods under process-relevant operating conditions. This approach results in an optimized biocatalyst that enables cost-efficient processes that are relatively simple to run in conventional manufacturing equipment allowing for efficient technical transfer of our processes to our manufacturing partners. This also allows for efficient technical transfer of our processes to our manufacturing partners.

The successful embodiment of our CodeEvolver® protein engineering technology platform in commercial manufacturing processes requires well-integrated expertise in a number of technical disciplines. In addition to those competencies directly integrated in our CodeEvolver® protein engineering platform, such as molecular biology, enzymology, microbiology, cellular engineering, metabolic engineering, bioinformatics, biochemistry and high throughput analytical chemistry, our process development projects also involve integrated expertise in organic chemistry, chemical process development, chemical engineering, bioprocess development and fermentation engineering. Our integrated, multi-disciplinary approach to product and process development is a critical success factor for the Company.

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the manufacture of small molecule pharmaceuticals, which remains a primary business focus. Our customers, which include many large, global pharmaceutical companies, use our technology, products and services in their process development and in manufacturing. Additionally, we have licensed our proprietary CodeEvolver® protein engineering technology platform to global pharmaceutical companies enabling them to use this technology, in house, to engineer enzymes for their own businesses. In May 2019, we entered into a Platform Technology Transfer and License Agreement (the “Novartis CodeEvolver® Agreement”) with Novartis Pharma AG (“Novartis”). The Novartis CodeEvolver® Agreement (Codexis’ third such agreement with large pharma companies) allows Novartis to use our proprietary CodeEvolver® protein engineering platform technology in the field of human healthcare.

As evidence of our strategy to extend our technology beyond pharmaceutical manufacturing, we have also used the technology to develop biocatalysts and enzyme products for use in a broader set of industrial markets, including several large verticals, such as food, feed, consumer care and fine chemicals. In addition, we are using our technology to develop enzymes for various life science related applications, such as next generation sequencing (“NGS”), DNA and RNA synthesis and other molecular biology research applications. In December 2019, we entered into a license agreement to provide Roche Sequencing Solutions, Inc. ("Roche") with our first enzyme for this target market: the Company’s EvoT4™ DNA ligase. In June 2020, we entered into a co-marketing and enzyme supply collaboration agreement with Alphazyme LLC for the production and co-marketing of enzymes for life science applications including, initially, high-fidelity DNA polymerase, T7 RNA polymerase and reverse transcriptase enzymes. In June 2020, we also entered into a Master Collaboration and Research Agreement with Molecular Assemblies, Inc. ("MAI") (the “MAI Agreement”) pursuant to which we are leveraging our CodeEvolver® platform

technology to improve the DNA polymerase enzymes that are critical for enzymatic DNA synthesis. We anticipate completing an enzyme engineering project with MAI in the first quarter of 2022.

We have been using the CodeEvolver® protein engineering technology platform to develop early stage, novel biotherapeutic product candidates, both in partnership with customers and for our own proprietary Codexis drug candidates. Our first program was for the potential treatment of phenylketonuria ("PKU") in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we entered into a Global Development, Option and License Agreement (the "Nestlé License Agreement") with Societé des Produits Nestlé S.A., formerly known as Nestec Ltd. ("Nestlé Health Science") to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive license to develop and commercialize CDX-6114. Also in October 2017, we entered into a strategic collaboration agreement with Nestle Health Science ("Nestlé SCA") pursuant to which we and Nestlé Health Science are collaborating to leverage the CodeEvolver® platform technology to develop other novel enzymes for Nestlé Health Science's established Consumer Care and Medical Nutrition business areas.

In March 2020, we entered into a Strategic Collaboration and License Agreement ("Takeda Agreement") with Shire Human Genetic Therapies, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited ("Takeda"), for the research and development of novel gene therapies for certain disease indications, including the treatment of lysosomal storage disorders and a blood factor deficiency.

BUSINESS SEGMENTS

We manage our business as two business segments: Performance Enzymes and Novel Biotherapeutics. See Note 15, "Segment, Geographical and Other Revenue Information" in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K.

Performance Enzymes

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the manufacture of small molecule pharmaceuticals and, to date, this continues to be our largest market served. Our customers, which include many large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development. We have also used the technology to develop customized enzymes for use in other industrial markets. These markets consist of several large industrial verticals, including food, feed, consumer care, and fine chemicals. We also use our technology in the life sciences markets to develop enzymes for customers using NGS and PCR/qPCR for in vitro molecular diagnostic and molecular biology research applications, as well DNA/RNA synthesis and health monitoring applications.

Novel Biotherapeutics

We are also targeting new opportunities in the pharmaceutical industry to discover, improve, and/or develop biotherapeutic drug candidates. We believe that our CodeEvolver® protein engineering platform technology can be used to discover novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability or immunogenicity. Our first lead program was for the potential treatment of hyperphenylalaninemia ("HPA") (also referred to as PKU) in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we announced a global development, option and license agreement with Nestlé Health Science to advance CDX-6114, our own novel orally administrable enzyme therapeutic candidate for the potential treatment of PKU. In July 2018, we announced that we had dosed the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, which was conducted in Australia. The initiation of the trial triggered a $4.0 million milestone payment from Nestlé Health Science. The $1.0 million milestone payment that was triggered by the achievement of a formulation relating to CDX-6114 was received in February 2019. In January 2019, we received notice from the U.S. Food and Drug Administration ("FDA") that it had completed its review of our investigational new drug application ("IND") for CDX-6114 and concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU. As a result of the option exercise, we earned a milestone and recognized $3.0 million in revenues in the first quarter of 2019. Upon exercising its option, Nestlé Health Science assumed all responsibilities for future clinical development and commercialization of CDX-6114.

In October 2017, we separately entered into the Nestlé SCA with Nestlé Health Science pursuant to which we and Nestlé Health Science are collaborating to leverage the CodeEvolver® platform technology to develop other novel enzymes for Nestlé Health Science's established Consumer Care and Medical Nutrition business areas. The term of the Nestlé SCA has been extended through December 2022.

In January 2020, we and Nestlé Health Science entered into a development agreement pursuant to which we and Nestlé Health Science are collaborating to advance CDX-7108, a lead candidate targeting a gastrointestinal disorder, discovered through the Nestlé SCA, into preclinical and early clinical studies. During 2021, we, together with Nestlé Health Science, continued to advance CDX-7108 towards initiation of a Phase 1 clinical trial with the first subject being dosed in November 2021.

In March 2020, we entered into the Takeda Agreement with Takeda pursuant to which we are collaborating to research and develop protein sequences for use in gene therapy products for certain disease indications in accordance with the respective program plans for Fabry Disease, Pompe Disease, and an undisclosed blood factor deficiency. In March 2020, we received a one-time, non-refundable cash payment of $8.5 million. Of these programs, the Fabry disease program is the most advanced, with multiple sequences, including CDX-6311, which were provided to Takeda. We also provided sequences to Takeda for the Pompe program. In May 2021, Takeda elected to exercise their option to initiate an additional program for a certain undisclosed rare genetic disorder and we received the option exercise fee during the third quarter of 2021.

RECENT DEVELOPMENT - PFIZER (PAXLOVID™)

In the first and second quarters of 2021, we began to receive purchase orders from Pfizer, Inc. ("Pfizer") for large quantities of our proprietary enzyme product, CDX-616, for use by Pfizer in the manufacture of a critical intermediate for its proprietary active pharmaceutical ingredient, nirmatrelvir. Pfizer markets, sells and distributes nirmatrelvir, in combination with the active pharmaceutical ingredient ritonavir, as its PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets) product, which received emergency use authorization by the U.S. Food and Drug Administration ("FDA") in late 2021 for the treatment of COVID-19 in humans.

In 2021, we recognized approximately $34.5 million in revenue from the sale of quantities of CDX-616 to Pfizer. In addition, as of December 31, 2021, we have received additional purchase orders from Pfizer for delivery of a significant quantity of CDX-616 in 2022. We have received and currently expect to receive additional purchase orders from Pfizer for significant quantities of CDX-616 during the course of 2022 for delivery in 2022 and 2023. As of December 31, 2021, we have not yet executed a long-term purchase and sale agreement with Pfizer for CDX-616; with or without a long-term purchase and sale agreement, we currently expect that future orders for quantities of CDX-616 by Pfizer will continue to be based on the needs of Pfizer for quantities of CDX-616 and there will be no minimum purchase obligation on the part of Pfizer.

BUSINESS UPDATE REGARDING COVID-19

We are subject to risks and uncertainties as a result of the current COVID-19 pandemic. The COVID-19 pandemic has presented a substantial public health and economic challenge around the world and is affecting our employees, communities and business operations, as well as the U.S. economy and other economies worldwide. The full extent to which the COVID-19 pandemic will directly or indirectly impact our business, results of operations and financial condition will depend on future developments that are highly uncertain and may not be accurately predicted, including the duration and severity of the pandemic, the prevalence of more contagious and or virulent variants such as the Delta and Omicron variants, and the extent and severity of the impact on our customers, new information that may emerge concerning COVID-19, the actions taken to contain it or treat its impact and the economic impact on local, regional, national and international markets.

In the United States, the impact of COVID-19, including governmental orders ("Orders") governing the operation of businesses during the pandemic, caused the temporary closure of our Redwood City, California facilities in 2020 and disrupted our R&D operations. R&D operations for several projects were temporarily suspended from mid-March 2020 through the end of April 2020 in accordance with these Orders. In May 2020, we re-initiated limited R&D operations and have ramped up operations such that we are currently utilizing our normal R&D capacity while following county, state and federal COVID-19 guidance for the protection of our employees. Additionally, we resumed manufacturing at our Redwood City pilot plant in May 2020.

To date, we and our collaboration partners have been able to continue to supply our enzymes to our customers worldwide. However, we are dependent on our manufacturing and logistics partners and consequently, disruptions in operations of our partners and customers may affect our ability to supply enzymes to our customers. Furthermore, our ability to provide future research and development ("R&D") services will continue to be impacted as a result of governmental orders and any disruptions in operations of our customers with whom we collaborate. We believe that these disruptions have had a minimal

impact on our revenue for the year ended December 31, 2021. The extent to which the pandemic may impact our business operations and operating results will continue to remain highly dependent on future developments, which are uncertain and cannot be predicted with confidence.

Our future results of operations and liquidity could be adversely impacted by delays in payments of outstanding receivable amounts beyond normal payment terms, supply chain disruptions and uncertain demand, and the impact of any initiatives or programs that we may undertake to address financial and operations challenges faced by our customers. The near-and-long term impact of COVID-19 to our financial condition, liquidity, or results of operations remains uncertain. Although some of the Orders that were enacted to control the spread of COVID-19 have begun to be scaled back and the vaccine rollout has expanded, surges in the spread of COVID-19 due to the emergence of new more contagious or virulent variants or the ineffectiveness of the vaccines against such strains, may result in the reimplementation of certain Orders, which could adversely impact our business. The extent to which the COVID-19 pandemic may materially impact our financial condition, liquidity, or results of operations in the future is uncertain.

As a result of the COVID-19 pandemic we have received purchase orders from Pfizer for large quantities of our proprietary enzyme product, CDX-616, for use by Pfizer in the manufacture of a critical intermediate for its proprietary active pharmaceutical ingredient, nirmatrelvir, used by Pfizer in combination with the active pharmaceutical ingredient ritonavir, as its PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets) product for the treatment of COVID-19 infections in humans. These purchase orders have had a substantial impact on our revenue in 2021.

For additional information on the various risks posed by the COVID-19 pandemic, see "Risk Factors" set forth in Item 1A of this Annual Report on Form 10-K.

OUR STRATEGY

Our strategy is to grow our revenues, profits, and stockholder value by leveraging our CodeEvolver® protein engineering technology platform in the following ways:

- *Licensing our CodeEvolver® protein engineering technology platform.* We intend to continue to pursue opportunities to license our CodeEvolver® protein engineering technology platform to third parties so they can create cost-saving biocatalyst solutions utilizing their own in-house protein engineering capability.
- *Growing our pharmaceutical biocatalysts business.* We intend to continue to pursue opportunities in the pharmaceutical market to use our protein catalysis products and services to reduce the costs for manufacturing small molecule drugs. We intend to increase the number of pharmaceutical customers and processes that utilize and benefit from our novel, cost-saving biocatalyst solutions.
- *Creating and advancing novel biotherapeutic drug candidates.* We intend to continue to pursue opportunities to apply our protein engineering capabilities to the creation and development of novel biotherapeutic drug candidates, both in partnership with customers and as proprietary Codexis drug candidates. We have also invested in research and development in an effort to generate additional early stage novel biotherapeutic candidates.
- *Extending our biocatalysts and industrial enzymes business into new markets.* We intend to continue to pursue opportunities to use biocatalyst products and services to reduce the costs and improve sustainability for manufacturing in markets such as food and food ingredients. We intend to increase the number of customers and industrial verticals that utilize and benefit from our novel performance enzyme solutions.
- *Developing high-performance enzymes for use in diagnostic applications*. We intend to offer high-performance enzymes to customers using NGS and PCR/qPCR for *in vitro* molecular diagnostic applications.

In this Annual Report, the "Company," "we," "us" and "our" refer to Codexis, Inc. and its subsidiaries on a consolidated basis.

OUR MARKET OPPORTUNITIES

Pharmaceutical Market

We believe the pharmaceutical industry represents a significant market opportunity for us and is our primary business focus. Pharmaceutical companies are in constant search for new drugs to offer to their customers, and are under significant competitive pressure both to reduce costs and to increase the speed to market for their products. To meet these pressures, pharmaceutical companies are discovering and developing novel protein-based drug products, as well as seeking manufacturing processes for their new and existing drugs that reduce overall costs, simplify production and increase efficiency and product yield, while not affecting drug safety and efficacy. Cost reduction is even more important to developers (known as innovators)

of patent-protected pharmaceutical products when the patents for those products expire and such innovators are forced to compete with manufacturers of generic drugs.

The pharmaceutical product lifecycle begins with the discovery of new chemical entities and continues through preclinical and clinical development, regulatory review and approval, commercial scale-up, product launch, and, ultimately, patent expiration and the transition from branded to generic products. As innovators develop, produce and then market products, manufacturing priorities and processes evolve. Historically, innovators have focused on production cost reduction in the later stages of clinical development and have been reluctant to make process changes after a product has been launched. However, as pressures to reduce costs have increased, innovators have pursued cost reduction measures much earlier in the pharmaceutical product lifecycle and are increasingly looking for opportunities to improve their operating margins, including making manufacturing process changes for marketed products after the products have been launched if these changes can result in significant cost reductions. As a result, innovators are investing in new technologies, including our CodeEvolver® protein engineering technology platform, to improve their manufacturing productivity and efficiency or outsourcing the manufacture of their intermediates and active pharmaceutical ingredients ("API").

Our Solutions for the Pharmaceutical Market

Small Molecule Manufacturing Cost Reduction

Our pharmaceutical customers, which include many large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development. Our CodeEvolver® protein engineering technology platform enables us to deliver solutions to our customers in this market by developing and delivering optimized biocatalysts that perform chemical transformations at a lower cost and improve the efficiency and productivity of manufacturing processes. We provide value throughout the pharmaceutical product lifecycle. Our products and services allow us to provide benefits to our pharmaceutical customers in a number of cost saving ways, including any - and sometimes all - of the following:

- reducing the use of raw materials and reagents;
- eliminating multiple steps in the manufacturing process;
- improving purity, productivity and yield;
- using water as a primary solvent;
- eliminating hazardous inputs;
- enabling the use of simple equipment and reducing the need for capital expenditure;
- reducing energy requirements;
- reducing the generation of chemical byproducts or waste; and
- reducing the need for late-stage purifications.

Early in a pharmaceutical product’s lifecycle, pharmaceutical manufacturers can use our biocatalyst products and services to reduce manufacturing costs. If an innovator incorporates our products or processes into an approved product, we expect the innovator to continue to use our products or processes at least over the patent life of the marketed drug.

Pharmaceutical manufacturers can also use our products and services to reduce manufacturing costs after a product is launched. At this stage, changes in the manufacturing process originally approved by the drug regulator may require additional regulatory review. Typically, pharmaceutical companies will only seek regulatory approval for a manufacturing change if substantial cost savings are realizable. We believe that the cost savings associated with our products may lead our customers to change their manufacturing processes for approved products and, if necessary, seek regulatory approval of the new processes which incorporate our biocatalyst products. Moreover, we believe these cost savings are potentially attractive to generics manufacturers, who compete primarily on price.

In addition, manufacturing processes that utilize our biocatalysts can frequently enable processes that are more sustainable and environmentally friendly compared to alternative, traditional manufacturing approaches. This has led us to earn three U.S. EPA Presidential Green Chemistry Challenge awards for improved pharmaceutical manufacturing processes since we were founded. All three of these awards were associated with blockbuster drug products.

Licensing Our CodeEvolver® Protein Engineering Technology Platform

Licensing our CodeEvolver® protein engineering technology platform to pharmaceutical companies enables them to rapidly develop custom-designed enzymes that are highly optimized for efficient manufacturing processes. To date, we have entered into platform technology licensing agreements with each of GlaxoSmithKline Intellectual Property Development Limited, a

subsidiary of GlaxoSmithKline plc ("GSK"), Merck, Sharp & Dohme ("Merck") and Novartis Pharma AG ("Novartis"), and we intend to continue to enter into license arrangements with third parties that will allow them to use our CodeEvolver® protein engineering technology platform to discover and develop novel proteins for their internal use.

GlaxoSmithKline

We entered into our first CodeEvolver® protein engineering Platform Technology Transfer, Collaboration and License Agreement ("GSK CodeEvolver® Agreement") in July 2014 with GlaxoSmithKline Intellectual Property Development Limited, a subsidiary of GSK, pursuant to which we granted GSK a non-exclusive, worldwide license to use our CodeEvolver® protein engineering technology platform in the field of human healthcare for its internal development purposes.

Under the GSK CodeEvolver® Agreement, we licensed and transferred our certain patents, patent applications and know-how from our CodeEvolver® protein engineering technology platform to GSK, completing the transfer in April 2016. Under this agreement, we have the potential to receive contingent payments that range from $5.75 million to $38.5 million per project based on GSK's successful application of the licensed technology. We are also eligible to receive royalties based on net sales, if any, of a limited set of products developed by GSK using our CodeEvolver® protein engineering technology platform.

The term of the GSK CodeEvolver® Agreement continues, unless earlier terminated, until the expiration of all payment obligations under the GSK CodeEvolver® Agreement. GSK can terminate the GSK CodeEvolver® Agreement by providing 90 days written notice to us.

In 2019, we received a $2.0 million milestone payment on the advancement of an enzyme developed by GSK using our CodeEvolver® protein engineering platform technology. In 2021, we received two additional milestone payments from GSK under the GSK CodeEvolver® Agreement.

Merck

In August 2015, we entered into a CodeEvolver® Platform Technology Transfer and License Agreement (the "Merck CodeEvolver® Agreement") with Merck. The Merck CodeEvolver® Agreement allows Merck to use our proprietary CodeEvolver® protein engineering platform technology in the field of human and animal healthcare.

Under the terms of the Merck CodeEvolver® Agreement, we granted to Merck an exclusive license under certain patents, patent applications and know-how from our CodeEvolver® protein engineering technology platform for the research, development and manufacture of novel enzymes for use by Merck in the chemical synthesis of therapeutic products owned or controlled by Merck ("Merck Exclusive Field") and a non-exclusive worldwide license to use the CodeEvolver® protein engineering technology platform to research, develop and manufacture novel enzymes for use by Merck in its internal research programs ("Merck Non-Exclusive Field").

Under the terms of the Merck CodeEvolver® Agreement, Merck paid us upfront technology transfer and license fees and milestone payments over the technology transfer period of 15 months from August 2015. We also have the potential to receive product-related payments of up to $15.0 million for each API that is manufactured by Merck using one or more enzymes that have been developed or are in development using the CodeEvolver® protein engineering technology platform during the 10-year period that begins on the conclusion of the 15-month technology transfer period. These product-related payments, if any, will be paid by Merck to us for each quarter that Merck manufactures API using a CodeEvolver®-developed enzyme. The payments will be based on the total volume of API produced using the CodeEvolver®-developed enzyme.

In September 2016, we completed the full transfer of the engineering platform technology. In October 2018, we entered into an amendment to the Merck CodeEvolver® Agreement whereby we amended certain licensing provisions and one exhibit. In January 2019, we entered into an amendment to the Merck CodeEvolver® Agreement whereby we installed certain CodeEvolver® protein engineering technology upgrades into Merck's platform license installation. We maintained those upgrades for a multi-year term that expired in January 2022.

Novartis

In May 2019, we entered into a Platform Technology Transfer and License Agreement (the "Novartis CodeEvolver® Agreement") with Novartis. The Novartis CodeEvolver® Agreement allows Novartis to use our proprietary CodeEvolver® protein engineering platform technology in the field of human healthcare.

Under the terms of the Novartis CodeEvolver® Agreement, Codexis granted to Novartis a worldwide license to use certain patents, patent applications and know-how from our CodeEvolver® protein engineering technology platform to research, develop and manufacture novel enzymes for use by or on behalf of Novartis as biocatalysts in the chemical synthesis of small molecule and bioconjugate active pharmaceutical ingredients ("API"). The license is exclusive for the research, development

and manufacture of novel enzymes for use by Novartis as biocatalysts in the chemical synthesis of API owned or controlled by Novartis ("Novartis Exclusive Field") and non-exclusive license for the research, development and manufacture of novel enzymes for use by Novartis in the chemical synthesis of API not owned or controlled by Novartis or any third party ("Novartis Non-Exclusive Field").

In July 2021, we announced the completion of the technology transfer period during which we transferred our proprietary CodeEvolver® platform technology to Novartis (the "Technology Transfer Period").

Pursuant to the Novartis CodeEvolver® Agreement, we received an upfront payment of $5.0 million shortly after the effective date. We completed the second technology milestone transfer under the agreement and received a milestone payment of $4.0 million in 2020. We have also received an aggregate of $5.0 million for the completion of the third technology transfer milestone in 2021.

In consideration for the continued disclosure and license of improvements to the technology and materials during a multi-year period that began on the conclusion of the Technology Transfer Period ("Improvements Term"), Novartis will pay us annual payments over four years which amount to an additional $8.0 million in aggregate. We also have the potential to receive quantity-dependent, usage payments for each API that is manufactured by Novartis using one or more enzymes that have been developed or are in development using the CodeEvolver® platform technology during the period that began on the conclusion of the Technology Transfer Period and ends on the expiration date of the last to expire licensed patent. These product-related usage payments, if any, will be paid by Novartis to Codexis for each quarter that Novartis manufactures API using a CodeEvolver® -developed enzyme.

The licenses to Novartis are granted under patents, patent applications and know-how that Codexis owns or controls as of the effective date and that cover the CodeEvolver® platform technology. Any improvements to the CodeEvolver® platform technology during the Technology Transfer Period will also be included in the license grants from Codexis to Novartis.

See also "Recent Development - Pfizer (PAXLOVID™)" above for information on our relationship with Pfizer.

Biotherapeutic Discovery and Development Partnerships

We are also targeting new opportunities in the pharmaceutical industry to discover or improve biotherapeutic drug candidates for our customers. We believe that our CodeEvolver® protein engineering platform technology can be used to discover novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability or immunogenicity.

We approach biopharmaceutical companies to collaborate and utilize our platform technology for the discovery of specific novel biotherapeutic candidates. We currently have one such biotherapeutic discovery partnership in progress under the Nestlé SCA with Nestlé Health Science and another discovery partnership in progress under the Takeda Agreement with Takeda. We continue to pursue other partners who could benefit by the application of our CodeEvolver® protein engineering platform technology to improve the discovery and/or development of other biotherapeutics in partnership with us.

Biotherapeutic Product Discovery and Development

We are also using our platform technology to self-fund the development of our own early stage, novel enzyme therapeutic product candidates. The first product candidate that resulted from this is CDX-6114, an enzyme which we have engineered to be orally administered and is being developed by Nestlé Health Science as a potential treatment of PKU in humans. PKU is an inborn metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. As a result, phenylalanine accumulates to toxic levels in the brain, causing serious neurological problems including intellectual disability, seizures and cognitive and behavioral problems. To avoid toxic levels of phenylalanine in their blood, individuals with PKU must follow a strict, life-long diet that is low in phenylalanine and supplement their diet with a synthetic phenylalanine-free formula to provide them with sufficient nutrients. Maintaining a strict, life-long diet can be challenging for individuals with PKU. There are an estimated 50,000 people with PKU in the developed world.

Our self-funded biotherapeutic investments aim to discover therapeutic solutions for five additional rare disease conditions. Two of those programs are targeting potential enzyme substitution treatments for patients with inborn errors of amino acid metabolism diseases.

CDX-6512 is an orally administrable enzyme substitution therapy candidate in IND-enabling studies for potential treatment of homocystinuria (HCU). The U.S. Food and Drug Administration (FDA) has granted the company orphan drug designation (ODD) and rare pediatric disease (RPD) designation for CDX-6512 for the treatment of HCU, an inborn metabolic disorder most commonly due to cystathionine beta-synthase (CBS) deficiency. CBS is an enzyme involved in the metabolism of

homocysteine, a methionine metabolite. As a result, methionine and/or homocysteine accumulate to toxic levels, that may lead to learning and intellectual disabilities, cardiovascular disease, osteoporosis, and stroke. To prevent blood levels of methionine and/or homocysteine to become toxic, individuals with HCU must follow a strict, life-long diet that is low in methionine and supplement their diet with a synthetic methionine-free formula to provide them with sufficient nutrients. Maintaining a strict, life-long diet can be challenging for individuals with HCU. World-wide about 1 in 150,000 people has HCU due to either a CBS or an MTHFR gene mutation. HCU is listed on the Recommended Uniform Screening Panel of disorders recommended by the Secretary of the Department of Health and Human Services for states to screen as part of their universal newborn screening programs.

CDX-6210 is an orally administrable enzyme substitution therapy lead for potential treatment of Maple Syrup Urine Disease (MSUD). MSUD is an inborn metabolic disorder in which the branched-chain keto acid dehydrogenase enzyme that is involved in the metabolism of branched-chain amino acids such as leucine, isoleucine, and valine, is deficient. As a result, these amino acids and their ketoacid metabolites accumulate to toxic levels, that can lead to intellectual and developmental disabilities. To prevent blood levels of these amino acids and their metabolites to become toxic, individuals with MSUD must follow a strict, life-long diet that is low in branched-chain amino acids and supplement their diet with a synthetic branched-chain amino acids-free formula to provide them with sufficient nutrients. Maintaining a strict, life-long diet can be challenging for individuals with MSUD. According to the Genetic and Rare Disease Information Center (GARD), about 1 in 150,000-185,000 people is born with MSUD. MSUD is listed on the Recommended Uniform Screening Panel of disorders recommended by the Secretary of the Department of Health and Human Services for states to screen as part of their universal newborn screening programs.

Our discovery program target a potential enzyme therapy for gluten management and potential treatments for patients with lysosomal storage diseases, via a specific novel transgene, or via a new AAV technology. We expect to continue to make additional investments with the aim of generating additional product candidates targeting these, and potentially other therapeutic areas.

Nestlé Health Science

In October 2017, we entered into the Nestlé License Agreement with Nestlé Health Science pursuant to which we granted to Nestlé Health Science, under certain of our patent rights and know-how: (i) an option to obtain an exclusive, worldwide, royalty-bearing, sublicensable license to develop and commercialize certain products (each, a "Product") based on CDX-6114 and our other therapeutic enzyme product candidates covered by specified patent applications for the treatment of HPA (also referred to as PKU), and (ii) an exclusive right of first negotiation (the "Right of First Negotiation") for a period of five years to obtain an exclusive worldwide license to develop and commercialize up to two enzymes discovered by us for use in the field of the prevention, diagnosis, treatment and management of inborn errors of amino acid metabolism. We are not under any obligation to undertake any research and development activities relating to inborn errors of amino acid metabolism. HPA is a medical condition characterized by elevated concentrations of the amino acid phenylalanine in the blood. PKU can result in severe HPA.

In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU.

Upon exercising its option, Nestlé Health Science assumed all responsibilities for future clinical development and commercialization of CDX-6114, with the exception of the completion of an extension study, CDX-6114-004, which was substantially completed in the fourth quarter of 2019. The parties established a patent committee to discuss strategies and coordinate activities for the patents related to CDX-6114 and product containing CDX-6114, and we will jointly own all inventions and information that result from each party's activities performed under the Nestlé License Agreement. The Nestlé License Agreement also contains customary representations and warranties by the parties, intellectual property protection provisions, certain indemnification rights in favor of each party and customary confidentiality provisions and limitations of liability.

We are also eligible to receive payments from Nestlé Health Science under the Nestlé License Agreement that include (i) development and approval milestones of up to $85.0 million, (ii) sales-based milestones of up to $250.0 million in the aggregate, which aggregate amount is achievable if net sales exceed $1.0 billion in a single year, and (iii) tiered royalties, at percentages ranging from the mid-single digits to low double-digits, of net sales of products.

In October 2017, we entered into the Nestlé SCA pursuant to which we and Nestlé Health Science are collaborating to leverage the CodeEvolver® protein engineering technology platform to develop novel enzymes for Nestlé Health Science's established Consumer Care and Medical Nutrition business areas. The term of the Nestlé SCA has been extended through December 2022.

In January 2020, we entered into a development agreement with Nestlé Health Science pursuant to which we and Nestlé Health Science are collaborating to advance CDX-7108 into preclinical and early clinical studies. CDX-7108 is the lead candidate targeting exocrine pancreatic insufficiency discovered under the Nestlé SCA. During 2021, we, together with Nestlé Health Science, continued to advance CDX-7108 towards initiation of a Phase 1 clinical trial with the first subject being dosed in November 2021. Additionally, the parties are progressing one orally administered enzyme therapy program under the Nestlé SCA targeting a gastrointestinal disorder.

Shire Human Genetic Therapies/Takeda Pharmaceutical

In March 2020, we entered into the Takeda Agreement with Takeda pursuant to which we are collaborating to research and develop protein sequences for use in gene therapy products for certain diseases (each, a "Field") in accordance with each applicable program plan (each, a "Program Plan"). On execution of the Takeda Agreement, we received an upfront nonrefundable cash payment of $8.5 million and we initiated activities under three Program Plans for Fabry Disease, Pompe Disease, and an undisclosed blood factor deficiency, respectively (the "Initial Programs"). We are primarily responsible for the research and development of protein sequences under the Program Plans (the "Protein Sequences") and we are eligible to earn up to $10.5 million of research and development fees and preclinical milestone payments for the Initial Programs. Takeda has the right, but not the obligation, to develop, manufacture and commercialize gene therapy products that include nucleic acid sequences that encode the protein sequences ("products") at their expense. Takeda has the right to a certain number of additional disease indications ("Reserved Target Indications") for a limited time period during which Takeda may initiate a Program Plan for one or more Reserved Target Indications ("Additional/Option Program," with Initial Programs, the "Programs"), provided, (a) if Takeda elects to initiate an Additional/Option Program while the parties are collaborating on three other Programs at the time of such election, or (b) if Takeda elects to initiate an Additional/Option Program using the last remaining Reserved Target Indication, then Takeda must pay us an option exercise fee to initiate such Additional/Option Program. We will own all rights to the protein sequences and corresponding nucleic acid sequences and related intellectual property rights and Takeda will own all rights to products and related intellectual property rights. In May 2021, Takeda elected to exercise their option to initiate an additional program for a certain undisclosed rare genetic disorder; as a result we received the option exercise fee during the third quarter of 2021. We are also eligible to receive up to $8.3 million of research and development fees and preclinical milestone payments for the fourth program under the Takeda Agreement.

We granted to Takeda an exclusive, worldwide, royalty-bearing, sublicensable license to use the protein sequences and their corresponding nucleic acid sequences to develop, manufacture and commercialize the applicable products in the applicable Field. We also granted to Takeda a limited non-exclusive, worldwide, sublicensable license (a) to research the protein sequences within or outside the applicable Fields and (b) to research the products outside of the applicable Fields, which such rights exclude Takeda's right to perform any Investigational New Drug-enabling activities. The licenses to research the Protein Sequences expire after a pre-determined period of time.

The term of the Takeda Agreement begins on the effective date of the Takeda Agreement and continues on a product-by-product and country-by-country basis, until the expiration of Takeda's obligation to pay royalties to the Company with respect to that product in that country. The Takeda Agreement expires in its entirety upon the expiration of Takeda's obligation to pay royalties to the Company with respect to the products in all countries worldwide. Subject to the terms of the Takeda Agreement, and after the first anniversary of the Effective Date with respect to the Initial Programs or after the first anniversary of confirmation of the applicable Program Plan by the parties with respect to the Additional/Option Programs, Takeda may terminate a Program upon specified prior written notice to the Company. Subject to the terms of the Takeda Agreement, Takeda may terminate the Takeda Agreement, at will, on a product-by-product basis upon specified prior written notice to the Company and the Takeda Agreement in its entirety upon specified prior written notice to the Company. Subject to the terms of the Takeda Agreement, Takeda may terminate the Takeda Agreement on a product-by-product basis for safety reasons upon specified prior written notice to the Company. Either party may terminate the Takeda Agreement for an uncured material breach by the other party, or the other party's insolvency or bankruptcy. Pursuant to the Takeda Agreement, we are eligible to receive other payments that include (i) clinical development and commercialization-based milestones, per target gene, of up to $100.0 million and (ii) tiered royalty payments based on net sales of applicable products at percentages ranging from the mid-single digits to low single-digits.

Fine Chemicals and Industrial Enzyme Markets

Beyond the pharmaceutical industry, our CodeEvolver® protein engineering platform technology has enabled cost-savings for our partners in the fine chemicals markets, and the food industry in particular. In November 2016, we entered into an exclusive agreement with Tate & Lyle, a market-leading food ingredients company, to supply a proprietary enzyme for use in Tate & Lyle's food ingredient production. In March 2017, we entered into a multi-year research and development agreement with Tate & Lyle for the development of a second ingredient for the food ingredient industry. We engineered a suite of enzymes that enable Tate & Lyle's novel bioconversion route for the manufacture of their newly-launched zero-calorie TASTEVA® M Stevia sweetener. In July 2021, we entered into a multi-year supply agreement with Kalsec to supply an enzyme product for

use in the production of Kalsec's newest natural hop acid.

We are seeking to expand our enzyme offerings in the fine chemical and industrial enzyme markets within and beyond the food industry, including, for example, to the animal feed, agricultural chemicals, consumer care, flavors and fragrances markets.

Molecular Biology and *In Vitro* Diagnostic Enzymes

We believe that our protein engineering capability can also be deployed to commercialize novel enzymes as improvements to enzymes consumed by customers in many industrial sectors. As our first effort in this strategy, we have developed enzymes for customers using NGS and PCR/qPCR for in vitro molecular diagnostic applications. In December 2019, we entered into a license agreement to provide Roche with our EvoT4™ DNA ligase high-performance molecular diagnostic enzyme. This enzyme was developed using our proprietary CodeEvolver® protein engineering platform and is expected to be incorporated into Roche's NGS library preparation kits and other sequencing products. During 2021, we commercialized three additional enzymes, our Codex® HiFi DNA Polymerase for use in next generation sequencing, our Codex® HiTemp Reverse Transcriptase for use in molecular diagnostic applications, and our Codex® HiCap RNA Polymerase for use in RNA synthesis applications.

Biocatalyst Products and Services

Our biocatalyst products and services can deliver value to our customers in multiple potential ways:

- manufacture their products at lower cost;
- manufacture their products with lower fixed capital investment;
- reduce the cost of development of complex chemical synthesis processes;
- enable their products to achieve higher product purity;
- allow the removal of entire steps from chemical production; and
- provide flexibility to apply at any point across their product's lifecycle.

Our products include biocatalysts, chemical intermediates and Codex® biocatalyst panels and kits. We sell our products worldwide primarily through our direct sales and business development force in the United States and Europe.

In addition to products, we also offer research and development services to our customers. These research and development service agreements often contain service fee payments and intellectual property provisions under which we screen and/or engineer biocatalysts for customers in connection with their process development efforts. In these collaborations, we typically receive consideration in the form of one or more of the following: upfront payments, milestone payments, payments for screening and engineering services, licensing fees and royalties.

Biocatalysts

We often sell biocatalysts, by the gram or kilogram, that have already been engineered, scaled up, and installed in a customer's commercial process. For example, we sell biocatalysts to Merck for their manufacture of Sitagliptin, the active ingredient in Januvia®. We also sell biocatalysts which are in developmental stages. These are enzymes that are sold by the batch or by the gram or kilogram that are in the process of being engineered or scaled up by Codexis, or are in the process of being trialed or approved for use in the customer's process. We may sell batches of specific biocatalysts that are in the midst of protein engineering efforts, in order to test their performance at a larger scale or to accelerate a customer's process development. We may also sell batches of specific biocatalysts for use in a customer's developmental products (for example, for use in the manufacture of a customer's Phase 2 drug candidate). Finally, we may sell batches of specific biocatalysts as a customer performs trials for approval in their commercial manufacturing operations.

Chemical Intermediates

In some cases, we sell intermediate chemicals products that are produced in a process that uses our biocatalysts. These chemical intermediates are then used by our customer for further chemical processing.

Codex® Biocatalyst Panels and Kits

We sell kits and panels of our biocatalysts. These kits and panels assemble a relevant subset of our engineered enzymes to enable customers to perform chemistry screening on their own. These kits and panels are organized by specific types of chemical reactions that are widely applicable in the pharmaceutical and fine chemical markets.

Biocatalyst Screening Services

If a customer prefers, rather than purchasing our Codex® Biocatalyst Panels or Kits to use for its own screening, it may send us its starting materials and desired chemical reaction, and we will test against our existing libraries of enzymes on a research and development service fee basis. If we detect desired activity in a specific enzyme, we can supply the customer with this enzyme or perform engineering services to improve the performance of the enzyme.

Protein Engineering Services

We work with our customers throughout their product development lifecycle to optimize enzymes that have been engineered specifically to perform a desired process according to a highly selective set of specifications. We typically charge customers for research and development services by project or project-month. These are typically larger research and development service fees than screening services.

The protein engineering process starts by identifying genes that code for enzymes known to have the general type of catalytic reactivity for a desired chemical reaction. Typically, we identify gene sequences from our extensive in-house collection or from published databases and then synthesize candidate genes having those sequences. Using a variety of biotechnology tools, we diversify these genes by introducing mutations, giving rise to changes in the enzymes for which they encode. The methods for diversifying these genes, and types of diversity being tested, often vary over the course of a protein engineering program. For finding initial diversity, methods typically include random mutagenesis and site-directed (included computational structure-guided) mutagenesis. We also test mutational variations from related enzymes found in different organisms.

Once we have identified potentially beneficial mutations, we create libraries of thousands of variants with combinations of these mutations. With our proprietary genetic manipulation tools, we generate libraries of genes that have programmed and random combinations of mutations for testing. The pool of genes is used to transform host cells, which entails introducing the various genes into host cells. These cells are then grown into colonies. Cells from individual colonies are cultured in high throughput to produce the enzyme encoded by the genetic variant in those cells. The enzymes expressed by these cells are then screened in high throughput using test conditions relevant to the desired application. The screening results allow us to identify and catalog individual genes that produce improved enzymes with beneficial mutations as well as enzymes having detrimental ones. Using specifically developed test conditions and analytical methods, we can identify variant enzymes that exhibit various improved performance characteristics, such as stability, activity and selectivity, under conditions relevant to the desired chemical process.

In the next step in our optimization process, we use our proprietary bioinformatics software to analyze protein sequence-activity relationships. Our software and algorithms relate the screening results to the mutations and rank the individual and interacting protein sequence mutations with regard to their degree of benefit or detriment, relative to the process parameter(s) tested. Using this information, we can create a select pool of mutational diversity in the next iteration to further the accumulation of beneficial diversity and cancel out detrimental diversity in the individual genes in the resulting library. The gene that codes for the best performing enzyme in one iteration is used as the starting gene for the next iteration of recombination and screening. As the enzymes improve over these iterations, the screening conditions are made increasingly more stringent. In this way, the biocatalyst is rapidly optimized until all in-process performance requirements have been achieved and the economic objectives for the desired process have been met.

INTELLECTUAL PROPERTY

Our success depends in large part on our ability to protect our proprietary products and technology under patent, copyright, trademark and trade secret laws. We also rely heavily on confidential disclosure agreements for further protection of our proprietary products and technologies. Protection of our technologies is important for us to offer our customers and partners proprietary services and products that are not available from our competitors, and to exclude our competitors from practicing technology that we have developed or exclusively licensed from other parties. For example, our ability to supply innovator pharmaceutical manufacturers depends on our ability to supply proprietary enzymes or methods for making pharmaceutical intermediates or APIs that are not available from our competitors. Likewise, in the generic pharmaceutical area, proprietary protection, through patent, trade secret or other protection of our enzymes and methods of producing a pharmaceutical product is important for us and our customers to maintain a lower cost production advantage over competitors.

As of December 31, 2021, we owned or controlled approximately 1,900 issued patents and pending patent applications in the United States and in various foreign jurisdictions, many of which are directed to our enabling technologies and specific methods and products that support our business in the pharmaceutical markets. In addition, our portfolio includes patents and pending patent applications that support our businesses in the biotherapeutics, molecular diagnostics, food and other markets. Our patents and pending patent applications, if issued, have terms that expire between 2022 and approximately 2042. Our United States ("U.S.") patents and pending patent applications directed to the CodeEvolver® proprietary enabling technology platform developed internally by us have terms that expire between 2029 and approximately 2034. It is possible that some U.S. patents may be entitled to patent term extensions and/or patent term adjustments, which would extend the protection beyond these expiration dates. It is also possible that some patents in other jurisdictions will be entitled to additional patent term. Our current intellectual property rights also include patents, trademarks, copyrights, software and certain assumed contracts that we acquired from Maxygen, Inc. (“Maxygen”) in October 2010, which are associated with directed evolution technology, known as the MolecularBreeding™ technology platform developed by Maxygen. The intellectual property rights and assets that we acquired from Maxygen continue to be subject to existing exclusive and non-exclusive license rights granted by Maxygen to third parties. We continue to file new patent applications, for which terms generally extend 20 years from the non-provisional filing date in the United States.

As of December 31, 2021, we owned 100 trademark registrations in the United States and foreign jurisdictions, as well as many common law trademarks. These include, but are not limited to: Codexis®, Codex®, CodeEvolver®, Mosaic®, Sage®, Microcyp®, MCYP®, ProSAR®, Unlock the Power of Proteins®, the Codexis Protein Engineering Experts® logo, Strategist™, Continuity®™, Ameli™, Forager®™, Analogene®™, Harvester®™, Atoms®™, Riptide®™, APS™ and a Codexis design mark (i.e., the stylized Codexis logo).

COMPETITION

We face differing forms of competition in the small molecule pharmaceuticals, biotherapeutics and fine chemicals markets, as set forth below.

Small Molecule Pharmaceuticals

We market our biocatalyst products and services to manufacturers of small molecule pharmaceutical intermediates and APIs. Our primary competitors in that market are companies marketing either conventional, non-enzymatic catalysts or alternative biocatalyst products and services. We also sometimes face competition from existing in-house technologies (both biocatalysts and conventional catalysts) within our client and potential client companies. The principal methods of competition and competitive differentiation in this market are price, product quality and performance, including manufacturing yield, safety and environmental benefits and speed of delivery of product. Pharmaceutical manufacturers that use biocatalytic processes can face increased competition from manufacturers that use more conventional processes and/or manufacturers that are based in regions (such as India and China) with lower regulatory, safety and environmental costs.

The market for the manufacture and supply of APIs and intermediates is large, with many established companies. These companies include many of our large innovator and generic pharmaceutical customers, such as Merck, GSK, Novartis, Pfizer Inc. ("Pfizer"), Bristol-Myers Squibb Company ("Bristol-Myers"), KYORIN Pharmaceutical Co., Ltd. ("Kyorin"), Urovant Sciences GmbH ("Urovant"), and Teva Pharmaceutical Industries Limited ("Teva"), which have significant internal research and development efforts directed at developing processes to manufacture APIs and intermediates. The processes used by these companies include classical conventional organic chemistry reactions, chemo-catalytic reactions, biocatalytic reactions or combinations thereof. Our biocatalyst based manufacturing processes must compete with these internally developed routes.

We also compete with companies developing and marketing conventional catalysts include Solvias AG, BASF, Johnson-Matthey and Takasago International Corporation.

The market for supplying enzymes for use in pharmaceutical manufacturing is quite fragmented. There is competition from large industrial enzyme companies, such as Novozymes and Dupont, as well as subsidiaries of larger contract research/contract manufacturing organizations ("CRO/CMO"), such as Royal DSM N.V. ("DSM"), Cambrex Corporation, Lonza, WuXi STA and Almac Group Ltd. Some fermentation pathway design companies, like Ginkgo Bioworks and Zymergen, whose traditional focus has been to design microorganisms that express small molecule chemicals, could extend into designing organisms that express enzymes. There is also competition in the enzyme customization and optimization area from several smaller companies, such as BRAIN AG, Arzeda, c-LEcta GmbH and Evocatal GmbH.

We believe that our principal advantage is our ability to rapidly deliver customized biocatalysts for existing and new intermediates and APIs in the pharmaceutical manufacturing market. This capability has allowed us to create a breadth of biocatalysts with improved performance characteristics including, for example, better activity, stability, and activity on a range of substrates, compared to traditional chemistry-based manufacturing processes and naturally occurring (and thus not optimized) biocatalysts. We believe that our CodeEvolver® protein engineering platform technology provides substantially superior results, in shorter time frames, than companies offering competing biocatalyst development services.

Biotherapeutics

There are other companies that participate in the biotherapeutics market generally and the PKU market specifically. Many of these companies are large, successful and well-capitalized. BioMarin Pharmaceutical Inc. ("BioMarin") and Daiichi Sankyo Company market Kuvan® in the United States, Europe and Japan for the treatment of a certain type of PKU. In addition, BioMarin had gained FDA approval in May 2018 and began the commercial sales of Palynziq®, an injectable enzyme substitution therapy to address different options for care in the treatment of PKU. Subsequently in May 2019, BioMarin obtained marketing authorization for Palynziq® from the European Commission. Several companies, including Synlogic, Homology Medicines and Rubius have reported clinical efforts to develop biotherapeutic candidates for PKU. Beyond targeting PKU, Takeda, Genzyme / Sanofi S.A., BioMarin, and other companies market or are actively developing enzyme therapeutics. There are numerous companies that are developing other forms of therapeutics, such as small molecules, gene therapy, as well as therapies based on gene editing, which could compete with biotherapeutics.

Fine Chemicals

We face similar forms of competition in this market as in the small molecule pharmaceutical markets, with the exception that the risk of losing opportunities to larger competitors in fine chemicals is greater given the larger scale of opportunities available in the fine chemicals market compared to the pharmaceutical market. Our significant competitors in the fine chemicals markets include companies that have been in these marketplaces for many years, such as DuPont Industrial Biosciences ("DuPont Genencor"), DSM, Novozymes and A.B. Enzymes. These companies have greater resources in these markets than we do and have long-term supply arrangements already in place with customers. Our ability to compete in these markets may be limited by our relatively late entrance. We also face competition in both the fine chemicals and small molecule pharmaceutical markets from emerging companies, like Zymergen and Gingko Bioworks, who offer engineered microbe metabolic pathway approaches to these markets.

Core Technology

We are a leader in the field of protein engineering to create novel biocatalysts. Both our pharmaceuticals and fine chemicals businesses rely on our core technology. We are aware that other companies, organizations and persons have developed technologies that appear to have some similarities to our patented proprietary technologies. For example, we are aware that other companies, including Zymergen, Gingko Bioworks, Amyris, Absci and Amicus Therapeutics have alternative methods for obtaining and generating genetic diversity or use mutagenesis techniques to produce genetic diversity. In addition, academic institutions such as the California Institute of Technology, the Max Planck Institute and the Austrian Centre of Industrial Biotechnology are also working in this field. This field is highly competitive with companies and academic and research institutions actively seeking to develop technologies that could be competitive with our technologies.

Technological developments by others may result in our products and technologies, as well as products manufactured by our customers using our biocatalysts, becoming obsolete. We monitor publications and patents that relate to directed molecular evolution to be aware of developments in the field and evaluate appropriate courses of action in relation to these developments.

Many of our competitors have substantially greater manufacturing, financial, research and development, personnel and marketing resources than we do. As a result, our competitors may be able to develop competing and/or superior technologies and processes, and compete more aggressively and sustain that competition over a longer period of time than we could. Our technologies and products may be rendered obsolete or uneconomical by technological advances or entirely different approaches developed by one or more of our competitors.

OPERATIONS

Our corporate headquarters are located in Redwood City, California and provide general administrative support to our business and are the center of our research, development and business operations. We have limited internal manufacturing capacity at our headquarters in Redwood City. We expect to rely on third-party manufacturers for commercial production of our biocatalysts for the foreseeable future. Our in-house manufacturing is dedicated to producing both Codex® biocatalyst panels and kits and enzymes for use by our customers in pilot scale production. We also supply initial commercial quantities of biocatalysts for use by our collaborators to produce pharmaceutical intermediates and manufacture biocatalysts that we sell. In the first quarter of 2021, we entered into an arrangement to lease a facility in San Carlos, California to serve as an additional office and research and development laboratory space which we occupied beginning December 2021. Please see Note 15, "Segment, Geographical and Other Revenue Information" in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K for a description of our revenues and long-lived assets both within and outside of the United States, and with respect to the San Carlos facility, please see Note 13, "Commitments and Contingencies" in the Notes to our Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K.

Our research and development operations include efforts directed towards engineering biocatalysts, bioprocess development, cellular engineering, biocatalyst screening, metabolites, strain improvement, fermentation development and process engineering. We conduct enzyme evolution, enzyme production development, microbial bioprocess development, cellular engineering, microbial evolution and process engineering evaluations and design primarily at our headquarters in Redwood City, California. Manufacturing of our enzymes is conducted primarily in four locations, at our in-house facility in Redwood City, California and at third-party contract manufacturing organizations, Lactosan GmbH & Co. KG ("Lactosan") in Kapfenberg, Austria, ACS Dobfar S.p.A. ("ACSD") (formerly know as DPhar S.p.A.) in Anagni, Italy, and Alphazyme LLC ("Alphazyme") in Florida, United States. Generally, we perform smaller scale manufacturing in-house and outsource the larger scale manufacturing and a large percentage of our production of novel enzymes to contract manufacturing organizations.

GOVERNMENT REGULATION

In the United States, the FDA extensively regulates, among other things, the research, development, testing, manufacture, quality control, import, export, safety, effectiveness, labeling, packaging, storage, distribution, record keeping, approval, advertising, promotion, marketing, post-approval monitoring, and post-approval reporting of drug and biologic products under the Federal Food, Drug and Cosmetic Act, its implementing regulations and other laws, including, in the case of biologics, the Public Health Service Act. Our biotherapeutic product candidates are subject to regulation by the FDA as biologics. Biologics require the submission of a biologics license application ("BLA") and licensure, which constitutes approval, by the FDA before being marketed in the United States. We, along with third-party contractors and our collaborators, will be required to navigate the various preclinical, clinical and commercial approval requirements of the governing regulatory agencies of the countries in which we wish to conduct studies or seek approval or licensure of our product candidates. The process of obtaining regulatory approvals and the subsequent compliance with applicable federal, state, local and foreign statutes and regulations require the expenditure of substantial time and financial resources.

The process required by the FDA before a biologic product may be marketed in the United States generally involves the following:

- completion of preclinical laboratory tests and animal studies performed in accordance with the FDA's good laboratory practice ("GLP") regulations;
- submission to the FDA of an IND, which must become effective before clinical trials in the United States may begin;
- approval by an institutional review board ("IRB"), or ethics committee at each clinical site before the trial is commenced;
- performance of adequate and well-controlled human clinical trials to establish the safety, purity, and potency of the product candidate for each proposed indication, conducted in accordance with the FDA's good clinical practice ("GCP") regulations;
- preparation and submission to the FDA of a BLA after completion of all pivotal clinical trials:
- satisfactory completion of an FDA Advisory Committee review, if applicable;
- a determination by the FDA within 60 days of its receipt of a BLA to file the application for review;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities at which the product is produced to assess compliance with current good manufacturing practice ("cGMP") regulations and to assure that the facilities, methods and controls are adequate to preserve the biological product's continued safety, purity and potency, and of selected clinical investigation sites to assess compliance with Good Clinical Practices, or GCPs; and

- FDA review and approval of the BLA prior to any commercial marketing, sale or distribution of the product.

Preclinical and Clinical Trials

Once a product candidate is identified for development, it enters the preclinical testing stage. Preclinical studies include laboratory evaluations of drug chemistry, formulation and stability, as well as studies to evaluate toxicity in animals, which must be conducted in accordance with GLP requirements. The results of preclinical studies, together with manufacturing information and analytical data, are submitted to the FDA as part of an IND. An IND is a request for authorization from the FDA to administer an investigational new drug to humans. The central focus of an IND submission is on the general investigational plan and the protocol(s) for clinical studies. The IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA, within the 30-day time period, raises concerns or questions about the conduct of the clinical trial, including concerns that human research subjects will be exposed to unreasonable health risks, and imposes a clinical hold. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin.

A separate submission to an existing IND must also be made for each successive clinical trial conducted during product development, and the FDA must grant permission, either explicitly or implicitly by not objecting, before each clinical trial can begin. Progress reports detailing the results of the clinical trials, among other information, must be submitted at least annually to the FDA and written IND safety reports must be submitted to the FDA and the investigators for serious and unexpected suspected adverse events, findings from other studies or animal or in vitro testing that suggest a significant risk for human subjects and any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigator brochure.

Clinical trials involve the administration of the product candidate to human subjects under the supervision of qualified investigators in accordance with GCPs, which include the requirement that all research subjects provide their informed consent for their participation in any clinical study. Clinical trials are conducted under protocols detailing, among other things, the objectives of the clinical trial and the parameters and criteria to be used in monitoring safety and evaluating effectiveness. Each protocol must be submitted to the FDA as part of the IND. An independent IRB for each investigator site proposing to participate in a clinical trial must also review and approve the clinical trial and its informed consent form before it can begin at that site, and the IRB must monitor the clinical trial until it is completed. The FDA, the IRB, or the sponsor may suspend or discontinue a clinical trial at any time on various grounds, including a finding that the subjects are being exposed to an unacceptable health risk or that the trial is unlikely to meet its stated objectives. Some studies also include oversight by an independent group of qualified experts organized by the clinical study sponsor, known as a data safety monitoring board, which provides authorization for whether or not a study may move forward at designated check points based on access to certain data from the study and may halt the clinical trial if it determines that there is an unacceptable safety risk for subjects or other grounds, such as no demonstration of efficacy. There are also requirements governing the reporting of ongoing clinical studies and clinical study results to public registries.

For purposes of BLA approval, clinical trials are typically conducted in three sequential phases, which may overlap or be combined.

- *Phase 1* - Phase 1 clinical trials involve initial introduction of the investigational product into healthy human subjects or patients with the target disease or condition. These studies are typically designed to test the safety, dosage tolerance, absorption, metabolism and distribution of the investigational product in humans, the side effects associated with increasing doses, and, if possible, to gain early evidence of effectiveness.
- *Phase 2* - Phase 2 clinical trials typically involve administration of the investigational product to a limited patient population with a specified disease or condition to evaluate the preliminary efficacy, optimal dosage and dosing schedule and to identify possible adverse side effects and safety risks.
- *Phase 3* - Phase 3 clinical trials typically involve administration of the investigational product to an expanded patient population to further evaluate dosage, to provide statistically significant evidence of clinical efficacy and to further test for safety, generally at multiple geographically dispersed clinical trial sites. These clinical trials are intended to establish the overall risk/benefit ratio of the investigational product and to provide an adequate basis for product approval and physician labeling.

In some cases, the FDA may condition approval of a BLA on the sponsor's agreement to conduct additional clinical trials to further assess the biologic's safety and effectiveness after BLA approval. Such post-approval clinical trials are typically referred to as Phase 4 clinical trials. Concurrent with clinical trials, companies usually complete additional animal studies and must also develop additional information about the chemistry and physical characteristics of the biologic and finalize a process for manufacturing the biologic in commercial quantities in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the product candidate and manufacturers must develop, among other things, methods for testing the identity, strength, quality and purity of the final biological product. Additionally,

appropriate packaging must be selected and tested and stability studies must be conducted to demonstrate that the product candidate does not undergo unacceptable deterioration over its shelf life.

Although most clinical research performed in the United States in support of a BLA must be authorized in advance by the FDA, under the IND regulations and procedures described above, there are certain circumstances under which clinical trials can be conducted without submission of an IND. For example, a sponsor who wishes to conduct a clinical trial outside the United States may, but need not, obtain FDA authorization to conduct the clinical trial under an IND.

BLA Submission and FDA Review

Assuming successful completion of all required testing in accordance with all applicable regulatory requirements, the results of preclinical studies and clinical trials, together with other detailed information, including extensive manufacturing information and information on the composition of the biologic, are submitted to the FDA in the form of a BLA requesting approval to market the biologic for one or more specified indications. The BLA must include all relevant data available from preclinical and clinical studies, including negative or ambiguous results as well as positive findings, together with detailed information relating to the product's chemistry, manufacturing, controls, and proposed labeling, among other things. Data can come from company-sponsored clinical studies intended to test the safety and effectiveness of a use of the product, or from a number of alternative sources, including studies initiated by investigators. The submission of a BLA requires payment of a substantial user fee unless a waiver is granted. Each BLA submitted to the FDA is reviewed for administrative completeness and reviewability within 60 days of the FDA's receipt of the application. If the BLA is found to be complete, the FDA will file the BLA, triggering a full substantive review of the application. The FDA may refuse to file any BLA that it deems incomplete or not properly reviewable at the time of submission.

Once a BLA has been accepted for filing under the Prescription Drug User Fee Act, the FDA has a goal of reviewing BLAs within ten months of the 60-day filing date for BLAs designated for standard review or six months for priority review, but the overall timeframe is often extended by FDA requests for additional information or clarification. The FDA reviews a BLA to determine, among other things, whether the biological product is safe, pure and potent and whether the facility or facilities in which it is manufactured meet standards designed to assure the product's continued safety, purity and potency. The FDA may refer the application to an advisory committee for review, evaluation and recommendation as to whether the application should be approved. The FDA is not bound by the recommendation of an advisory committee, but it generally follows such recommendations.

Before approving a BLA, the FDA will inspect the facility or the facilities at which the biologic product is manufactured, and will not license the product unless cGMP compliance is satisfactory. The FDA may also inspect the sites at which the clinical trials were conducted to assess their compliance with GCP requirements, and will not license the biologic unless compliance with such requirements is satisfactory. If the FDA determines that the application, manufacturing process or manufacturing facilities are not acceptable, it will outline the deficiencies in the submission and often will request additional testing or information. Notwithstanding the submission of any requested additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval.

After the FDA evaluates a BLA and conducts inspections of manufacturing facilities where the investigational product and/or its drug substance will be produced, the FDA may issue an approval letter or a Complete Response Letter ("CRL"). An approval letter authorizes commercial marketing of the product with specific prescribing information for specific indications. A CRL will describe all of the deficiencies that the FDA has identified in the BLA, except that where the FDA determines that the data supporting the application are inadequate to support approval, the FDA may issue the CRL without first conducting required inspections, testing submitted product lots, and/or reviewing proposed labeling. In issuing the CRL, the FDA may recommend actions that the applicant might take to place the BLA in condition for approval, including requests for additional information or clarification. The FDA may delay or refuse approval of a BLA if applicable regulatory criteria are not satisfied, require additional testing or information and/or require post-marketing testing and surveillance to monitor safety or efficacy of a product.

If regulatory approval of a product is granted, such approval will be granted for particular indications and may entail limitations on the indicated uses for which such product may be marketed. For example, the FDA may approve the BLA with a Risk Evaluation and Mitigation Strategy ("REMS"), to ensure the benefits of the product outweigh its risks. A REMS is a safety strategy implemented to manage a known or potential serious risk associated with a product and to enable patients to have continued access to such medicines by managing their safe use, and could include medication guides, physician communication plans, or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. The FDA also may condition approval on, among other things, changes to proposed labeling or the development of adequate controls and specifications. Once approved, the FDA may withdraw the product approval if compliance with pre- and post-marketing requirements is not maintained or if problems occur after the product reaches the marketplace. The FDA may require one or more Phase 4 post-market studies and surveillance to further assess and monitor the product's safety and effectiveness after commercialization, and may limit further marketing of the product based on the results of these post-marketing studies.

Expedited Development and Review Programs

The FDA maintains several programs intended to facilitate and expedite development and review of new drugs and biologics to address unmet medical needs in the treatment of serious or life-threatening diseases or conditions.

For example a product candidate is eligible for Fast Track designation if it is intended to treat a serious or life-threatening disease or condition and demonstrates the potential to address unmet medical needs for such disease or condition. Fast Track designation applies to the combination of the product candidate and the specific indication for which it is being studied. Fast Track designation provides increased opportunities for sponsor meetings with the FDA during preclinical and clinical development, in addition to the potential for rolling review once a marketing application is filed, meaning that the FDA may review portions of the marketing application before the sponsor submits the complete application, if the sponsor provides a schedule for the submission of the sections of the BLA, the FDA agrees to accept sections of the BLA and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the BLA.,

In addition, a product candidate may be eligible for Breakthrough Therapy designation if it is intended to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product candidate may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. Breakthrough Therapy designation provides all the features of Fast Track designation in addition to intensive guidance on an efficient development program beginning as early as Phase 1, and FDA organizational commitment to expedited development, including involvement of senior managers and experienced review staff in a cross-disciplinary review, where appropriate.

Any product candidate submitted to the FDA for approval, including a product candidate with Fast Track or Breakthrough Therapy designation, may also be eligible for additional FDA programs intended to expedite the review process, including Priority Review designation and Accelerated Approval. A BLA is eligible for Priority Review if the product candidate is designed to treat a serious or life-threatening disease or condition, and if approved, would provide a significant improvement in safety or effectiveness in the treatment, diagnosis or prevention of a serious disease or condition.

Additionally, product candidates studied for their safety and effectiveness in treating serious or life-threatening diseases or conditions may receive Accelerated Approval if they can be shown to have an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit, or an effect on a clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality which is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments. As a condition of accelerated approval, the FDA will generally require the sponsor to perform adequate and well-controlled post-marketing clinical studies to verify and describe the anticipated effect on irreversible morbidity or mortality or other clinical benefit. Products receiving accelerated approval may be subject to expedited withdrawal procedures if the sponsor fails to conduct the required post-marketing studies or if such studies fail to verify the predicted clinical benefit. In addition, the FDA currently requires as a condition for accelerated approval pre-approval of promotional materials, which could adversely impact the timing of the commercial launch of the product.

Fast Track designation, Breakthrough Therapy designation, Priority Review designation and Accelerated Approval do not change the standards for approval but may expedite the development or review process. Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or decide that the time period for FDA review or approval will not be shortened.

Orphan drug designation and exclusivity

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug or biologic intended to treat a rare disease or condition, defined as a disease or condition with a patient population of fewer than 200,000 individuals in the United States, or a patient population greater than 200,000 individuals in the United States and when there is no reasonable expectation that the cost of developing and making available the drug or biologic in the United States will be recovered from sales in the United States for that drug or biologic. Orphan drug designation must be requested before submitting a BLA. After the FDA grants orphan drug designation, the generic identity of the therapeutic agent and its potential orphan use are disclosed publicly by the FDA.

If a product candidate that has orphan drug designation subsequently receives the first FDA approval for a particular active ingredient for the disease for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications, including a full BLA, to market the same biologic for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity or if the FDA finds that the holder of the orphan drug exclusivity has not shown that it can assure the availability of sufficient quantities of the orphan drug to meet the needs of patients with the disease or condition for which the drug was designated. Orphan drug exclusivity does not prevent the FDA from approving a different drug or biologic for the same disease or condition, or the same drug or biologic for a different disease or condition. Among the other benefits of orphan drug designation are tax credits for certain research and a waiver of the BLA application user fee.

A designated orphan drug many not receive orphan drug exclusivity if it is approved for a use that is broader than the indication for which it received orphan designation. In addition, orphan drug exclusive marketing rights in the United States may be lost if the FDA later determines that the request for designation was materially defective or, as noted above, if a second applicant demonstrates that its product is clinically superior to the approved product with orphan exclusivity or the manufacturer of the approved product is unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition.

Post-Approval Requirements

Licensed biologics that are manufactured and distributed in the United States are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product distribution, advertising and promotion and reporting of adverse experiences with the product. There is also a continuing, annual prescription drug program user fee.

Any biologics manufactured or distributed pursuant to FDA approvals remain subject to ongoing regulation by the FDA. Manufacturers and their subcontractors are required to register their establishments with the FDA and certain state agencies, and are subject to periodic unannounced inspections by the FDA and certain state agencies for compliance with ongoing regulatory requirements, including cGMP, which impose extensive procedural and documentation requirements. Failure to comply with statutory and regulatory requirements can subject a manufacturer to possible legal or regulatory action, such as warning letters, suspension of manufacturing, product seizures, injunctions, civil penalties or criminal prosecution.

Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information, requirements for post-market studies or clinical trials to assess new safety risks, imposition of distribution or other restrictions under a REMS. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- fines, warning letters, untitled letters, or holds on post-approval clinical trials;
- refusal of the FDA to approve applications or supplements to approved applications, or suspension or revocation of product approvals;
- product seizure or detention, or refusal to permit the import or export of products;
- mandated modification of promotional materials and labeling and the issuance of corrective information;
- the issuance of safety alerts, Dear Healthcare Provider letters, press releases and other communications containing warnings or other safety information about the product; or
- injunctions or the imposition of civil or criminal penalties.

The FDA closely regulates the post-approval marketing and promotion of biologics, including standards and regulations for direct-to-consumer advertising, off-label promotion, industry-sponsored scientific and educational activities, and promotional activities involving the internet and social media. A company can make only those claims relating to safety and efficacy that are approved by the FDA. Physicians may prescribe legally available biologics for uses that are not described in the product's labeling and that differ from those tested by us and approved by the FDA. Such off-label uses are common across medical specialties. Physicians may believe that such off-label uses are the best treatment for many patients in varied circumstances.

The FDA does not regulate the behavior of physicians in their choice of treatments. The FDA does, however, impose stringent restrictions on manufacturers' communications regarding off-label use. Failure to comply with these requirements can result in adverse publicity, warning letters, corrective advertising and potential civil and criminal penalties.

Biosimilars and Regulatory Exclusivity

As part of the Patient Protection and Affordable Care Act enacted in 2010, as amended by the Health Care and Education Reconciliation Act of 2010, the Biologics Price Competition and Innovation Act ("BPCIA") established an abbreviated pathway for the approval of biosimilar and interchangeable biological products. The abbreviated regulatory pathway provides legal authority for the FDA to review and approve biosimilar biologics based on their similarity to an existing brand product, referred to as a reference product, including the possible designation of a biosimilar as interchangeable with a brand product.

Biosimilarity, which requires that there be no clinically meaningful differences between the biological product and the reference product in terms of safety, purity, and potency, can be shown through analytical studies, animal studies, and a clinical study or studies. Interchangeability requires that a product is biosimilar to the reference product and the product must

demonstrate that it can be expected to produce the same clinical results as the reference product in any given patient and, for products that are administered multiple times to an individual, the biologic and the reference biologic may be alternated or switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic.

Under the BPCIA, the approval of a biosimilar product may not be made effective by the FDA until 12 years from the date on which the reference product was first licensed. Moreover, the extent to which a biosimilar, once approved, will be substituted for a reference product in a way that is similar to traditional generic substitution for non-biological drug products is not yet clear and will depend on a number of marketplace and regulatory factors that are still developing. In addition, the period of exclusivity provided by the BPCIA only operates against third parties seeking approval via the abbreviated pathway, but would not prevent third parties from pursuing approval via the traditional BLA approval pathway.

In addition, a biological product can also obtain pediatric market exclusivity in the United States. Pediatric exclusivity, if granted, adds six months to existing exclusivity periods and patent terms. This six-month exclusivity, which runs from the end of other exclusivity protection or patent term, may be granted based on the voluntary completion of a pediatric study in accordance with an FDA-issued "Written Request" for such a study. The BPCIA is complex and continues to be interpreted and implemented by the FDA.

Other Healthcare Laws

Pharmaceutical companies are subject to additional healthcare regulation and enforcement by the federal government and by authorities in the states and foreign jurisdictions in which they conduct their business and may constrain the financial arrangements and relationships through which we and our partners research, sell, market and distribute any products for which we obtain marketing approval. Such laws include, without limitation, state and federal anti-kickback, fraud and abuse, false claims, data privacy and security and transparency laws regarding drug pricing and payments and other transfer of value to physicians and other healthcare providers. If their operations are found to be in violation of any of such laws or any other governmental regulations that apply, they may be subject to penalties, including, without limitation, administrative, civil and criminal penalties, damages, fines, disgorgement, the curtailment or restructuring of operations, integrity oversight and reporting obligations, exclusion from participation in federal and state healthcare programs and individual imprisonment.

Coverage and Reimbursement

Sales of any product depend, in part, on the extent to which such product will be covered by third-party payors, such as federal, state, and foreign government healthcare programs, commercial insurance and managed healthcare organizations, and the level of reimbursement for such product by third-party payors. Decisions regarding the extent of coverage and amount of reimbursement to be provided are made on a plan-by-plan basis. These third-party payors are increasingly reducing reimbursements for medical products, drugs and services. In addition, the U.S. government, state legislatures and foreign governments have continued implementing cost-containment programs, including price controls, restrictions on coverage and reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit sales of any product. Decreases in third-party reimbursement for any product or a decision by a third-party payor not to cover a product could reduce physician usage and patient demand for the product and also have a material adverse effect on sales.

Healthcare Reform

In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, each as amended (collectively known as the "ACA"), was enacted, which substantially changed the way healthcare is financed by both governmental and private insurers, and significantly affected the pharmaceutical industry. The ACA contained a number of provisions, including those governing enrollment in federal healthcare programs, reimbursement adjustments and changes to fraud and abuse laws. For example, the ACA:

- increased the minimum level of Medicaid rebates payable by manufacturers of brand name drugs from 15.1% to 23.1% of the average manufacturer price;
- required collection of rebates for drugs paid by Medicaid managed care organizations;
- required manufacturers to participate in a coverage gap discount program, under which they must agree to offer 70 percent point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D; and
- imposed a non-deductible annual fee on pharmaceutical manufacturers or importers who sell "branded prescription drugs" to specified federal government programs.

Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA.

On June 17, 2021, the U.S Supreme Court dismissed the most recent judicial challenge to the AC brought by several states without specifically ruling on the constitutionality of the ACA. Thus, the ACA will remain in effect in its current form.

Other legislative changes have been proposed and adopted since the Affordable Care Act was enacted, including aggregate reductions of Medicare payments to providers of 2% per fiscal year, which was temporarily suspended from May 1, 2020 through March 31, 2022, and reduced payments to several types of Medicare providers. Moreover, there has recently been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products, which has resulted in several Congressional inquiries, proposed and enacted legislation and executive orders issued by the President designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drug products. Individual states in the United States have also become increasingly active in implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing.

Data Privacy and Security Laws

Numerous state, federal and foreign laws, including consumer protection laws and regulations, govern the collection, dissemination, use, access to, confidentiality, and security of personal information, including health-related information. In the United States, numerous federal and state laws and regulations, including data breach notification laws, health information privacy and security laws, and federal and state consumer protection laws and regulations (e.g., Section 5 of the Federal Trade Commission Act) that govern the collection, use, disclosure, and protection of health-related and other personal information could apply to our operations or the operations of our partners. In addition, certain state and non-U.S. laws, such as the California Consumer Privacy Act ("CCPA"), the California Privacy Rights Act ("CPRA"), and the General data Protection Regulation ("GDPR"), govern the privacy and security of personal information, including health-related information in certain circumstances, some of which are more stringent than HIPAA and many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts. Failure to comply with these laws, were applicable, can result in the imposition of significant civil and /or criminal penalties and private litigation. Privacy and security laws, regulations, and other obligations are constantly evolving, may conflict with each other to make compliance efforts more challenging, and can result in investigations, proceedings, or actions that lead to significant penalties and restrictions on data processing.

CUSTOMERS

We rely on a limited number of key customers for the majority of our revenues. Customers that provided 10% or more of our total revenues in any of the past three fiscal years consist of the following:

	Percentage of Total Revenues For the Years Ended December 31.		
Customers:	**2021**	**2020**	**2019**
Customer A	33 %	*	*
Customer B	11 %	26 %	28 %
Customer C	*	19 %	*
Customer D	*	11 %	15 %
Customer E	*	*	23 %

** Percentage was less than 10%*

HUMAN CAPITAL RESOURCES

As of December 31, 2021, we had 261 full-time employees and part-time employees worldwide. Of these employees, 159 were engaged in research and development, 37 were engaged in operations and quality control and 65 were engaged in selling, general and administrative activities. None of our employees is represented by a labor union. Supported by our annual employee survey, we believe our relationship with our employees to be generally good. Our scientists, bioinformatics experts and other professionals work collaboratively as interdisciplinary teams to unlock and advance technological innovation.

Compensation, benefits and development

Our goal is to attract, motivate and retain talent with a focus on encouraging performance, promoting accountability and adhering to our company values. We offer competitive compensation and benefit programs including a company-matched 401(k) Plan, stock options for eligible employees, health savings and flexible spending accounts, paid time off, education and training programs, and employee assistance programs. We believe it is important to help build community and enabling our employees actively participate in community service projects and in company-sponsored philanthropic activities.

Diversity, inclusion and belonging

We are committed to our continued efforts to increase diversity and foster an inclusive work environment that supports the global workforce and the communities we serve. We recruit the best people for the job regardless of gender, ethnicity or other protected traits and it is our policy to fully comply with all laws applicable to discrimination in the workplace. Our diversity, equity and inclusion principles are also reflected in our employee training and policies. We continue to enhance our diversity, equity and inclusion policies which are guided by our executive leadership team.

Health and safety

We are committed to maintain a safe and healthy workplace for our employees. Our policies and practices are intended to protect our employees and surrounding communities in which we operate.

In 2020, in response to the COVID-19 pandemic, we implemented safety protocols and new procedures to protect our employees. These protocols include complying with social distancing and other health and safety standards as required by state and local government agencies, taking into consideration guidelines of the Centers for Disease Control and Prevention and other public health authorities. In addition, we modified the way we conduct many aspects of our business including the practice of social distancing, wearing face coverings mandated by state and local regulations, and maintaining a quarantine for employees determined to be in close contact with a COVID-19 case. For example, we implemented day-time shift hours in our R&D and manufacturing at our Redwood City pilot plant to minimize the number of employees in close proximity to each other and we have significantly expanded the use of virtual interaction whenever possible in our business. For a detailed discussion of the impact of the COVID-19 pandemic on our human capital resources, see “Risk Factors" Item 1A of this Form 10-K.

We previously launched the Employee-Requested Work from Home Policy in late 2020. This policy establishes the process and criteria to enable Redwood City employees to request permission to work from home on a regular basis.

CORPORATE & AVAILABLE INFORMATION

We were incorporated in Delaware in January 2002 as a wholly-owned subsidiary of Maxygen, Inc. We commenced independent operations in March 2002, after licensing core enabling technology from Maxygen, Inc. Our principal corporate offices are located at 200 Penobscot Drive, Redwood City, California 94063 and our telephone number is (650) 421-8100. Our internet address is www.codexis.com. The information on, or that can be accessed through, our website is not incorporated by reference into this Annual Report on Form 10-K or any other filings we make with the U.S. Securities and Exchange Commission (the “SEC”).

We make available on or through our website certain reports and amendments to those reports that we file with, or furnish to, the SEC in accordance with the Exchange Act. These include our Annual Reports on Form 10-K, our Quarterly Reports on Form 10-Q and our Current Reports on Form 8-K, and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act. We make this information available on or through our website free of charge as soon as reasonably practicable after we electronically file the information with, or furnish it to, the SEC. Copies of this information may be obtained at the SEC website at www.sec.gov. The contents of these websites are not incorporated into this filing. Further, the references to website URLs are intended to be inactive textual references only.

ITEM 1A. RISK FACTORS

You should carefully consider the risks described below together with the other information set forth in this Annual Report on Form 10-K, which could materially affect our business, financial condition or future results. The risks described below are not the only risks facing our company. Risks and uncertainties not currently known to us or that we currently deem to be immaterial also may materially adversely affect our business, financial condition and/or operating results.

RISK FACTORS SUMMARY

The following is a summary of the principal factors that cause an investment in the company to be speculative or risky:

- A significant portion of revenue growth in 2021 is as a result of the receipt of purchase orders from Pfizer for CDX-616. Revenues in 2022 and in future years from our sales of CDX-616 to Pfizer are subject to a number of factors which are outside of our control and may not materialize.
- We do not have a long term sale and purchase agreement with Pfizer for CDX-616 and we currently expect that future orders for quantities of CDX-616 by Pfizer will continue to be based on the needs of Pfizer for quantities of CDX-616.
- We have a history of net losses and we may not achieve or maintain profitability.
- We are dependent on our collaborators, and our failure to successfully manage these relationships could prevent us from developing and commercializing many of our products.
- We are dependent on a limited number of customers, including Pfizer.
- The ongoing COVID-19 pandemic has adversely affected and may continue in the future to, directly or indirectly, adversely affect our business, results of operations and financial condition.
- Our product supply agreements with customers have finite duration and may not be extended or renewed.
- With respect to customers purchasing our products for the manufacture of API, the termination or expiration of such patent protection may materially and adversely affect our revenues, financial condition or results of operations.
- We are dependent on a limited number of contract manufacturers for large scale production of substantially all of our enzymes, including CDX-616.
- If we are unable to develop and commercialize new products for the target markets, our business and prospects will be harmed.
- Our biotherapeutic programs are early stage, highly regulated and expensive.
- If either Nestlé Health Science or Takeda terminate their development programs under their respective license agreements with us, any potential revenue from those license agreements will be significantly reduced or non-existent.
- Our efforts to deploy our technology platform in the fine chemicals market may fail.
- We may need additional capital in the future in order to expand our business.
- We have investments in non-marketable securities, which may subject us to significant impairment charges.
- Competitors and potential competitors who have greater resources and experience than we do may develop products and technologies that make ours obsolete.
- Ethical, legal and social concerns about genetically engineered products and processes could limit or prevent the use of our products, processes, and technologies and limit our revenues.
- If we engage in any acquisitions, we will incur a variety of costs and may potentially face numerous risks that could adversely affect our business and operations.
- We use hazardous materials in our business and we must comply with environmental laws and regulations.
- Our ability to use our net operating loss carryforwards to offset future taxable income may be subject to certain limitations.
- We or our customers may not be able to obtain regulatory approval for the use of our products in food and food ingredients, if required.
- Our ongoing efforts to deploy our technology in the life science tools market may fail.
- The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time consuming and inherently unpredictable, and we may be unable to obtain regulatory approval for our product candidates.

- Clinical trials are difficult to design and implement, expensive, time-consuming and involve an uncertain outcome.
- Results of preclinical studies and early clinical trials of product candidates may not be predictive of results of later studies or trials.
- Even if we obtain regulatory approval for any products that we develop alone or with collaborators, such products will remain subject to ongoing regulatory requirements.
- Our business operations and future relationships with investigators, healthcare professionals, consultants, third-party payors, patient organizations and customers will be subject to applicable healthcare regulatory laws, which could expose us to penalties.
- The successful commercialization of product candidates developed by us or our partners will depend in part on the extent to which governmental authorities and health insurers establish adequate coverage, reimbursement levels and pricing policies.
- Compliance with European Union chemical regulations could be costly and adversely affect our business and results of operations.
- We rely on third parties to conduct our clinical trials and perform some of our research and preclinical studies, which if not satisfactorily carried out or fail to meet expected deadlines, may have an adverse effect on our business and prospects.
- We contract with third parties for the manufacturing and supply of product candidates, which supply may become limited or interrupted or may not be of satisfactory quality and quantity.
- Our efforts to prosecute and protect our intellectual property may not be successful.
- Our ability to compete may decline if we do not adequately protect our proprietary technologies or if we lose some of our intellectual property rights.
- Third parties may claim that we are infringing their intellectual property rights or other proprietary rights, which may subject us to costly and time-consuming litigation.
- We may be involved in lawsuits to protect or enforce our intellectual property rights, which could be expensive, time-consuming and unsuccessful.
- We may not be able to enforce our intellectual property rights throughout the world.
- If our biocatalysts are stolen, misappropriated or reverse engineered, others could use these biocatalysts to produce competing products.
- We are subject to anti-takeover provisions in our certificate of incorporation and bylaws and under Delaware law that could delay or prevent an acquisition of our company.
- Our quarterly or annual operating results may fluctuate in the future.
- We do not intend to pay cash dividends for the foreseeable future.
- If securities or industry analysts do not publish research or reports about our business, or publish negative reports about our business, our stock price and trading volume could decline.
- We face risks associated with our international business.
- Business interruptions resulting from disasters or other disturbances could delay us in the process of developing our products and could disrupt our sales.
- Confidentiality agreements with employees and others may not adequately prevent disclosures of trade secrets and other proprietary information.
- We are dependent on information technology systems, infrastructure and data, and any failure of these systems could harm our business.
- Actual or perceived failures to comply with applicable data protection, privacy and security laws, regulations, standards and other requirements could adversely affect our business, results of operations, and financial condition.
- Evolving expectations around ESG matters may expose us to reputational and other risks.

Risks Relating to Our Business and Strategy

A significant portion of our revenue growth in 2021 is as a result of the receipt of purchase orders from Pfizer for a proprietary enzyme product ("CDX-616") used by Pfizer in the manufacture of its active pharmaceutical ingredient nirmatrelvir for its COVID-19 antiviral therapeutic, PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets). Revenues in 2022 and in future years from our sales of CDX-616 to Pfizer are subject to a number of factors which are outside of our control and may not materialize.

Starting the first and second quarters of 2021, we began to receive purchase orders from Pfizer, Inc. ("Pfizer") for large quantities of our proprietary enzyme product, CDX-616, for use by Pfizer in the manufacture of a critical intermediate for its proprietary active pharmaceutical ingredient, nirmatrelvir. Pfizer markets, sells and distributes nirmatrelvir, in combination with the active pharmaceutical ingredient ritonavir, as its PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets) product, which received emergency use authorization ("EUA") by the U.S. Food and Drug Administration ("FDA") in late 2021 for the treatment of COVID-19 infections in humans.

In 2021, we recognized $34.5 million in revenue from the sale of quantities of CDX-616 to Pfizer. In addition, as of December 31, 2021, we have received additional purchase orders from Pfizer for delivery of a significant quantity of CDX-616 in 2022. We have received and currently expect to receive additional purchase orders from Pfizer for significant quantities of CDX-616 during the course of 2022 for delivery in 2022 and 2023.

Revenues in 2022 and in future years from our sales of CDX-616 to Pfizer and other potential customers (including sublicensees of Pfizer technology from The Medicines Patent Pool) are subject to a number of factors which are outside of our control, including, without limitation, the following, all of which could reduce or eliminate our sales of CDX-616, and therefore materially and adversely affect our business, results of operations and financial condition:

- Pfizer has no future binding commitment to purchase any particular quantity or quantities of CDX-616 from us, and we are dependent upon Pfizer continuing to place orders with us (whether on a spot basis or under a long term agreement, when and if executed) for their requirements, if any, for CDX-616;
- to our knowledge, sublicensees of Pfizer technology from The Medicines Patent Pool (MPP) have no obligation to purchase CDX-616 from us under their sublicenses with MPP;
- the EUA granted by the FDA for the use of PAXLOVID™ for the treatment of COVID-19 infections in humans could be withdrawn at any time;
- future vaccine development and usage and the development and usage of other new therapies for the treatment or elimination of COVID-19 may eliminate or reduce demand for PAXLOVID™;
- new variants of COVID-19 may emerge which PAXLOVID™ is not effective in treating;
- Pfizer may not ultimately receive full marketing authorization for PAXLOVID™ from the FDA and other international regulatory authorities;
- Pfizer could reformulate or make changes in the manufacturing process for nirmatrelvir which would eliminate or reduce demand for the use of CDX-616 in its manufacture;
- sublicensees of Pfizer technology for the manufacture, sale and distribution of PAXLOVID™ from the MPP may not utilize CDX-616 in the manufacture of nirmatrelvir;
- national and regional governmental authorities (including those of the United States government) may mandate that raw materials and intermediates used in the manufacture of PAXLOVID™ to be marketed, sold and distributed within the borders of that country be domestically produced, which could eliminate or reduce demand for the use of CDX-616 in such country; and
- we may be unable (because of lack of available manufacturing capacity at our contract manufacturers, supply chain disruptions or an inability to obtain applicable regulatory approvals) to manufacture the quantities of CDX-616 that Pfizer may desire to purchase from us.

We do not have a long term sale and purchase agreement with Pfizer for CDX-616. \Whether or not a long term-purchase and sale agreement is executed, we currently expect that future orders for quantities of CDX-616 by Pfizer will continue to be based on the needs of Pfizer for quantities of CDX-616 and there will be no minimum purchase obligation on the part of Pfizer. If Pfizer ceases to issue or delays the issuance of orders for CDX-616, our results of operations and financial condition will be materially and adversely affected.

As of December 31, 2021, we have not yet executed a long term sale and purchase agreement with Pfizer for CDX-616. All of the orders for CDX-616 that we have received from Pfizer to date have been in the form of purchase orders for individual deliveries of quantities of CDX-616 at mutually agreed upon pricing. Whether or not a long term purchase and sale agreement is executed, we currently expect that future orders for quantities of CDX-616 by Pfizer will continue to be based on the then current needs of Pfizer for quantities of CDX-616 and there will be no minimum purchase obligation on the part of Pfizer. If Pfizer's demand for CDX-616 declines or is eliminated, and Pfizer ceases to issue or delays the issuance of orders for CDX-616, our results of operations and financial condition will be materially and adversely affected.

We have a history of net losses and we may not achieve or maintain profitability.

We have incurred net losses since our inception, including losses of $21.3 million in 2021, $24.0 million in 2020 and $11.9 million in 2019. As of December 31, 2021 and 2020, we had an accumulated deficit of $387.7 million and $366.4 million, respectively. If we are unable to expand our business, through new or expanded collaborations, development of new products or services, or increased sales of existing products and services, our net losses may increase and we may never achieve profitability. In addition, some of our collaboration agreements, including our collaboration with Nestlé Health Science and Takeda, and our performance enzyme agreements, including the agreements with GSK, Merck and Novartis, provide for milestone payments, usage payments, and/or future royalty payments, which we will only receive if we and our collaborators develop and commercialize products. We also may fund development of additional proprietary performance enzymes and/or biotherapeutic products. There can be no assurance that any of these products will become commercially viable or that we will ever achieve profitability on a quarterly or annual basis. If we fail to achieve profitability, or if the time required to achieve profitability is longer than we anticipate, we may not be able to continue our business. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis.

We are dependent on our collaborators, and our failure to successfully manage these relationships could prevent us from developing and commercializing many of our products and achieving or sustaining profitability, and could lead to disagreements with our current or former collaborators.

Our ability to maintain and manage collaborations in our markets is fundamental to the success of our business. We currently have license agreements, research and development agreements, supply agreements and/or distribution agreements with various collaborators. For example, we have ongoing collaborations and agreements with GSK, Merck, Novartis, Nestlé Health Science and Takeda that are important to our business and financial results. We may have limited or no control over the amount or timing of resources that any collaborator is able or willing to devote to our partnered products or collaborative efforts. Any of our collaborators may fail to perform its obligations. These collaborators may breach or terminate their agreements with us or otherwise fail to conduct their collaborative activities successfully and in a timely manner. Further, our collaborators may not develop products arising out of our collaborative arrangements or devote sufficient resources to the development, manufacture, marketing or sale of these products. Moreover, disagreements with a collaborator could develop, and any conflict with a collaborator could lead to litigation and could reduce our ability to enter into future collaboration agreements and negatively impact our relationships with one or more existing collaborators. If any of these events occur, especially if they occur in our collaborations with GSK, Merck, Novartis, Nestlé Health Science or Takeda, or if we fail to maintain our agreements with our collaborators, we may not be able to commercialize our existing and potential products or grow our business or generate sufficient revenues to support our operations, we may not receive contemplated milestone payments and royalties under the collaboration, and we may be involved in litigation. Our collaboration opportunities could be harmed and our financial condition and results of operations could be negatively affected if:

- we do not achieve our research and development objectives under our collaboration agreements in a timely manner or at all;
- we develop products and processes or enter into additional collaborations that conflict with the business objectives of our other collaborators;
- we, our collaborators and/or our contract manufacturers do not receive the required regulatory and other approvals necessary for the commercialization of the applicable product;

- we disagree with our collaborators as to rights to intellectual property that are developed during the collaboration, or their research programs or commercialization activities;
- we are unable to manage multiple simultaneous collaborations;
- our collaborators or licensees are unable or unwilling to implement or use the technology or products that we provide or license to them;
- our collaborators become competitors of ours or enter into agreements with our competitors;
- our collaborators become unable or less willing to expend their resources on research and development or commercialization efforts due to general market conditions, their financial condition or other circumstances beyond our control; or
- our collaborators experience business difficulties, which could eliminate or impair their ability to effectively perform under our agreements.

Even after collaboration relationships expire or terminate, some elements of the collaboration may survive. For instance, certain rights, licenses and obligations of each party with respect to intellectual property and program materials may survive the expiration or termination of the collaboration. Disagreements or conflicts between and among the parties could develop even though the collaboration has ended. These disagreements or conflicts could result in expensive arbitration or litigation, which may not be resolved in our favor.

Finally, our business could be negatively affected if any of our collaborators or suppliers undergoes a change of control or were to otherwise assign the rights or obligations under any of our agreements.

We are dependent on a limited number of customers, including Pfizer.

Our current revenues are derived from a limited number of key customers. For the years ended December 31, 2021 and 2020, customers that each individually contributed 10% or more of our total revenue accounted for 44% and 56% of our total revenues in 2021 and 2020, respectively. In particular, in 2021 Pfizer accounted for $34.5 million, or approximately 33%, of our total revenue. We expect a limited number of customers to continue to account for a significant portion of our revenues for the foreseeable future. This customer concentration increases the risk of quarterly fluctuations in our revenues and operating results. The loss or reduction of business from one or a combination of our significant customers could, materially adversely affect our revenues, financial condition and results of operations.

The ongoing COVID-19 pandemic has adversely affected and may continue in the future to, directly or indirectly, adversely affect our business, results of operations and financial condition.

The COVID-19 pandemic has had, and continues to have, a significant impact globally, prompting governments and businesses to take unprecedented measures in response. In the United States, the COVID-19 pandemic has and may continue in the future to, directly or indirectly, adversely affect our business, results of operations and financial condition, including as a result of compliance with governmental orders governing the operation of businesses during the pandemic, the temporary closure of our Redwood City, California facilities from mid-March 2020 through the end of April 2020 and disruption of our research and development operations.

The extent and severity of the impact on our business and clinical trials will be determined largely by the extent of disruptions in the supply chains for our products and product candidates; disruptions in access by patients to therapies for which our products are components of the supply chain; delays in the performance of research and development ("R&D") service work, and delays in current and future clinical trials that we or our collaboration partners may conduct. In addition, the impact of the COVID-19 pandemic on the operations of the FDA and other health authorities may delay potential approvals of product candidates for which our products are components of the supply chain. To date, we and our collaboration partners have been able to continue to supply our enzymes to our customers worldwide, however there can be no guarantee this will continue. Furthermore, our ability to provide future R&D services will continue to be impacted as a result of governmental orders and any disruptions in operations of our customers with whom we collaborate. We believe that these disruptions have had a minimal impact on our revenue for the year ended December 31, 2021. The extent to which the pandemic may impact our business operations and operating results will continue to remain highly dependent on future developments, which are uncertain and cannot be predicted with confidence.

In the future, our business could be materially adversely affected, directly or indirectly, by the widespread outbreak of contagious disease, including the ongoing COVID-19 pandemic. National, state and local governments in affected regions have implemented and may continue to implement safety precautions, including quarantines, border closures, increased border controls, travel restrictions, governmental orders and shutdowns, business closures, cancellations of public

gatherings and other measures. Organizations and individuals are taking additional steps to avoid or reduce infection, including limiting travel and staying home from work. These measures are disrupting normal business operations both in and outside of affected areas and have had significant negative impacts on businesses and financial markets worldwide.

The potential impact and duration of COVID-19 or another pandemic or public health crisis has had and could continue to have, significant repercussions across regional, national and global economies and financial markets, and could trigger a period of regional, national and global economic slowdown or regional, national or global recessions. The outbreak of COVID-19 in many countries continues to adversely impact regional, national and global economic activity and has contributed to significant volatility and negative pressure in financial markets. As a result, we may experience difficulty accessing debt and equity capital on attractive terms, or at all, due to the severe disruption and instability in the global financial markets. In addition, our customers may terminate or amend their agreements for the purchase of our products or services due to bankruptcy, lack of liquidity, lack of funding, operational failures, or other reasons.

We continue to monitor our operations and applicable government recommendations, and we have made modifications to our normal operations because of the COVID-19 pandemic, including requiring most office-based employees to work remotely. Notwithstanding these measures, the COVID-19 pandemic could affect the health and availability of our workforce as well as those of the third parties we rely on taking similar measures. If members of our management and other key personnel in critical functions across our organization are unable to perform their duties or have limited availability due to COVID-19, we may not be able to execute on our business strategy and/or our operations may be negatively impacted. We may also experience limitations in employee resources, including because of sickness of employees or their families or the desire of employees to avoid contact with individuals or large groups of people. In addition, we have experienced and will continue to experience disruptions to our business operations resulting from quarantines, self-isolations and other restrictions on the ability of our employees to perform their jobs.

While it is not possible at this time to estimate the entirety of the impact that the COVID-19 pandemic will have on our business, operations, employees, customers, suppliers or our collaboration partners, the continued spread of COVID-19 and the prevalence of more contagious and or virulent variants such as the Delta and Omicron variants, measures taken by governments, actions taken to protect employees and the broad impact of the pandemic on all business activities may materially and adversely affect our business, results of operations and financial condition.

Our product supply agreements with customers have finite duration, may not be extended or renewed and generally do not require the customer to purchase any particular quantity or quantities of our products.

Our product supply agreements with customers generally have a finite duration, may not be extended or renewed and generally do not require the customer to purchase any particular quantity or quantities of our products. While our products are not considered commodities and may not be easily substituted for by our customers, particularly when our products are used in the manufacture of active pharmaceutical ingredients, our customers may nevertheless terminate or fail to renew their product supply agreements with us or significantly curtail their purchases thereunder under certain circumstances. Any such termination or reduction could materially adversely affect our revenues, financial condition and results of operations. For the year ended December 31, 2021, we derived a majority of our product revenue from these product supply agreements.

With respect to customers purchasing our products for the manufacture of active pharmaceutical ingredients ("API") for which they have exclusivity due to patent protection, the termination or expiration of such patent protection and any resulting generic competition may materially and adversely affect our revenues, financial condition or results of operations.

With respect to customers purchasing our products for the manufacture of API, or lead to the manufacture of API, for which exclusivity due to patent protection has or is about to expire, we can expect that the quantity of our products sold to such customers for such products may decline as generic competition for the API increases. While we anticipate that we may, in some cases, also be able to sell products to these generic competitors for the manufacture of these APIs, or lead to

the manufacture of these APIs, the overall effect on our revenues, financial condition and results of operations could be materially adverse.

We are dependent on a limited number of contract manufacturers for large scale production of substantially all of our enzymes, including CDX-616. We are working to qualify new contract manufacturers to produce certain of our enzymes, including CDX-616, however those efforts may not be successful and therefore we may experience limitations on our ability to supply our enzymes to customers.

Manufacturing of our enzymes is conducted primarily in four locations: our in-house facility in Redwood City, California, and at three third-party contract manufacturing organizations, Lactosan GmbH & Co. KG ("Lactosan"), in Kapfenberg, Austria, ACS Dobfar S.p.A. ("ACSD") (formerly known as DPhar S.p.A.), in Anagni, Italy, and Alphazyme LLC in Florida, United States. Generally, we perform smaller scale manufacturing in-house and outsource the larger scale manufacturing to these contract manufacturers. We have limited internal capacity to manufacture enzymes. As a result, we are dependent upon the performance and capacity of third-party manufacturers for the larger scale manufacturing of the enzymes used in our pharmaceutical and fine chemicals business.

Accordingly, we face risks of difficulties with, and interruptions in, performance by third party manufacturers, the occurrence of which could adversely impact the availability, launch and/or sales of our enzymes in the future. Enzyme manufacturing capacity limitations at our third party manufacturers and manufacturing delays could negatively affect our business, reputation, results of operations and financial condition. The failure of any contract manufacturer to supply us our required volumes of enzyme on a timely basis, or to manufacture our enzymes in compliance with our specifications or applicable quality requirements or in volumes sufficient to meet demand, would adversely affect our ability to sell pharmaceutical and fine and complex chemicals products, could harm our relationships with our collaborators or customers and could negatively affect our revenues and operating results. We may be forced to secure alternative sources of supply, which may be unavailable on commercially acceptable terms, and could cause delays in our ability to deliver products to our customers, increase our costs and decrease our profit margins.

We currently have supply agreements in place with Lactosan, ACSD, and Alphazyme. In the absence of a supply agreement, a contract manufacturer will be under no obligation to manufacture our enzymes and could elect to discontinue their manufacture at any time. If we require additional manufacturing capacity and are unable to obtain it in sufficient quantity, we may not be able to increase our product sales, or we may be required to make substantial capital investments to build that capacity or to contract with other manufacturers on terms that may be less favorable than the terms we currently have with our suppliers. If we choose to build our own additional manufacturing facility, it could take two years or longer before our facility is able to produce commercial volumes of our enzymes. Any resources we expend on acquiring or building internal manufacturing capabilities could be at the expense of other potentially more profitable opportunities. In addition, if we contract with other manufacturers, we may experience delays of several months in qualifying them, which could harm our relationships with our collaborators or customers and could negatively affect our revenues or operating results.

If we are unable to develop and commercialize new products for the pharmaceutical, fine chemicals, biotherapeutics, diagnostics and life science tools markets, our business and prospects will be harmed.

We plan to launch new products for the pharmaceutical, fine chemicals, biotherapeutics, diagnostics and other life science tools markets. These efforts are subject to numerous risks, including the following:

- customers in these markets may be reluctant to adopt new manufacturing processes that use our enzymes;
- we may be unable to successfully develop the enzymes or manufacturing processes for our products in a timely and cost-effective manner, if at all;
- we may face difficulties in transferring the developed technologies to our customers and the contract manufacturers that we may use for commercial scale production of intermediates and enzymes in these markets;
- the contract manufacturers that we may use may be unable to scale their manufacturing operations to meet the demand for these products and we may be unable to secure additional manufacturing capacity;
- customers may not be willing to purchase these products for these markets from us on favorable terms, if at all;
- we may face product liability litigation, unexpected safety or efficacy concerns and product recalls or withdrawals;

- changes in laws or regulations relating to the pharmaceutical industry or the industries into which we sell our fine chemicals products, including the food industry, could cause us to incur increased costs of compliance or otherwise harm our business;
- our customers' products may experience adverse events or face competition from new products, which would reduce demand for our products;
- we may face pressure from existing or new competitive products; and
- we may face pricing pressures from existing or new competitors, some of which may benefit from government subsidies or other incentives.

Our biotherapeutic programs are early stage, highly regulated and expensive. Our ability to obtain additional development partners or additional funding for the programs, to advance our product candidates to clinical trials and to ultimately receive regulatory approvals is highly uncertain.

We are developing and have developed novel biotherapeutic candidates, including CDX-6114, the novel oral enzyme product candidate for the treatment of PKU that we licensed to Nestlé Health Science. We are also developing protein sequences for use in gene therapy products for Fabry Disease, Pompe Disease, an undisclosed blood factor deficiency and a certain undisclosed rare genetic disorder for Takeda. The successful development of biotherapeutic candidates involves many risks and uncertainties, requires long timelines and may lead to uncertain results. In addition, drug development is highly regulated and requires areas of expertise and capital resources we do not currently possess. In order to market a biologic product in the United States, we or our collaborators must undergo the following process required by the FDA:

- completion of extensive preclinical laboratory tests and preclinical animal studies, all performed in accordance with GLP requirements;
- submission to the FDA of an IND, which must become effective before human clinical studies may begin in the United States;
- approval by an independent IRB representing each clinical site before the clinical study may be initiated at the site;
- performance of adequate and well-controlled human clinical studies (generally divided into three phases) in accordance with GCP requirements to establish the safety, purity and potency (or efficacy) of the product candidate for each proposed indication;
- preparation of and submission to the FDA of a BLA after completion of all clinical studies;
- potential review of the product candidate by an FDA advisory committee;
- satisfactory completion of an FDA pre-approval inspection of the manufacturing facilities where the product candidate is produced to assess compliance with cGMP requirements; and
- FDA review and approval of a BLA prior to any commercial marketing or sale of the product in the United States.

If we fail to comply with applicable FDA or other regulatory requirements at any time during the drug development process, clinical testing, the approval process or after approval, we may become subject to administrative or judicial penalties, including the FDA's refusal to approve a pending application, withdrawal of an approval, warning letters, product recalls, and additional enforcement actions.

Our efforts to advance our biotherapeutic candidates that we develop are subject to numerous risks, including the following:

- The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time consuming and the results are inherently unpredictable. If we are ultimately unable to obtain regulatory approval for biotherapeutic product candidates, our business will be harmed. To obtain regulatory approval to market any product candidate, preclinical studies and costly and lengthy clinical trials are required, and the results of the studies and trials are highly uncertain. A failure of one or more preclinical or clinical trials can occur at any stage, and many companies that have believed their drug candidates performed satisfactorily in preclinical and clinical testing have nonetheless failed to obtain marketing approval of their product candidates.
- We may find it difficult to enroll patients in our clinical trials for product candidates. Any enrollment difficulties could delay clinical trials and any potential product approval.

- We may experience difficulty or delay in obtaining the FDA's acceptance of an IND for product candidates we may seek to enter into clinical development, which would delay initiation of Phase 1 clinical testing. Delays in the commencement or completion of clinical testing could significantly affect our product development costs or the product development costs of our present and any future collaborators. We do not know whether planned clinical trials will begin on time or be completed on schedule, if at all. The commencement and completion of clinical trials can be delayed for a number of reasons. For example, a clinical trial may be suspended or terminated by us, by the IRB of the institution in which such trial is being conducted, or by the FDA due to a number of factors, including unforeseen safety issues, changes in governmental regulations or lack of adequate funding to continue the clinical trial.
- We have limited experience in drug development or regulatory matters related to drug development. As a result, we rely or will rely on third parties to conduct our preclinical and clinical studies, assist us with drug manufacturing and formulation and perform other tasks for us. If these third parties do not successfully carry out their responsibilities or comply with regulatory requirements, we may receive lower quality products or services, suffer reputational harm and not be able to obtain regulatory approval for product candidates.
- Our efforts to use CodeEvolver® protein engineering technology platform to generate new lead biotherapeutic candidates, whether under our collaborations with Nestlé Health Science, Takeda or otherwise, may not be successful in creating candidates of value.
- We will be exposed to potential product liability risks through the testing of experimental therapeutics in humans, which may expose us to substantial uninsured liabilities.
- Third parties may develop intellectual property that could limit our ability to develop, market and commercialize product candidates.
- Changes in methods of treatment of disease, such as gene therapy, could cause us to stop development of our product candidates or reduce or eliminate potential demand for CDX-6114, if approved, or any other product candidates that we may develop in the future.

If either Nestlé Health Science or Takeda terminate their development programs under their respective license agreements with us, any potential revenue from those license agreements will be significantly reduced or non-existent, and our results of operations and financial condition will be materially and adversely affected.

We have invested significant time and financial resources in the development of CDX-6114 and other product candidates for the treatment of HPA now included in the Nestlé License Agreement as well as in the development of candidates for the treatment of Fabry disease and Pompe disease which are now included in the Takeda Agreement.

Under the Nestlé License Agreement, we are eligible to receive payments from Nestlé Health Science that include (i) development and approval milestones of up to $85.0 million, (ii) sales-based milestones of up to $250.0 million in the aggregate, which aggregate amount is achievable if net sales exceed $1.0 billion in a single year, and (iii) tiered royalties, at percentages ranging from the mid-single digits to low double-digits, of net sales of product. Under the Takeda Agreement, we are eligible to earn potential payments that include (i) reimbursement of research and development fees and preclinical development milestone payments for the three initial programs of $10.5 million, in aggregate, and $8.3 million for the fourth program, (ii) clinical development and commercialization-based milestone, per target gene, of up to $100.0 million, and (iii) tiered royalty payments based on net sales of applicable products at percentages ranging from the mid-single digits to low single-digits. While we have received milestone payments under the Nestlé License Agreement to date there is no guarantee that we will receive further milestone payments under the Nestlé Agreement or Takeda Agreement in the future.

Under the Nestle Agreement and the Takeda Agreement, either Nestlé Health Science and Takeda, as applicable, may each terminate the entire agreement or specified programs thereunder at will under certain circumstances as described in more detail under "Item 1. Business--Our Market Opportunities--Pharmaceutical Market--Our Solutions for the Pharmaceutical Market--Biotherapeutic Product Discovery and Development" in this Annual Report on Form 10-K.

If Nestlé Health Science terminates its rights and obligations with respect to the Nestlé License Agreement and/or Takeda terminates its rights and obligations with respect to the Takeda Agreement, then depending on the timing of such event:

- the development of our product candidates subject to the respective agreements may be terminated or significantly delayed;
- our cash expenditures could increase significantly if it is necessary for us to hire additional employees and allocate scarce resources to the development and commercialization of product candidates;

- we would bear all of the risks and costs related to the further development and commercialization of product candidates that were previously the subject of the respective agreements, including the reimbursement of third parties; and
- in order to fund further development and commercialization of new product candidates or programs, we may need to seek out and establish alternative collaboration arrangements with third-party partners; this may not be possible, or we may not be able to do so on terms which are acceptable to us, in which case it may be necessary for us to limit the size or scope of one or more of our programs or increase our expenditures and seek additional funding by other means.

Our efforts to deploy our technology platform in the fine chemicals market may fail.

We have recently begun to use our CodeEvolver® protein engineering technology platform to develop new products in the fine chemicals markets. We do not know if we can successfully compete in this new market. This new market is well established and consists of numerous large, well-funded entrenched market participants who have long and established track records and customer relationships. We have currently developed products in the food sector of this market and these products, or any other products that we may develop in the future for the fine chemicals market may not succeed in displacing current products. If we succeed in commercializing new products for the fine chemicals market, we may not generate significant revenues and cash flows from these activities. The failure to successfully deploy products in the fine chemicals space may limit our growth and have a material adverse effect on our financial condition, operating results and business prospects.

We may need additional capital in the future in order to expand our business.

Our future capital requirements may be substantial, particularly as we continue to develop our business. Although we believe that, based on our current level of operations, our existing cash, cash equivalents and equity securities will provide adequate funds for ongoing operations, planned capital expenditures and working capital requirements for at least the next 12 months, we may need additional capital if our current plans and assumptions change. Our need for additional capital will depend on many factors, including the financial success of our performance enzyme business, our spending to develop and commercialize new and existing products and the amount of collaboration funding we may receive to help cover the cost of such expenditures, the effect of any acquisitions of other businesses, technologies or facilities that we may make or develop in the future, our spending on new market opportunities, including opportunities in the fine chemicals markets, and the filing, prosecution, enforcement and defense of patent claims. If our capital resources are insufficient to meet our capital requirements, and we are unable to enter into or maintain collaborations with partners that are able or willing to fund our development efforts or commercialize any products that we develop or enable, we will have to raise additional funds to continue the development of our technology and products and complete the commercialization of products, if any, resulting from our technologies. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. We may seek to obtain such additional capital through equity offerings, debt financings, credit facilities and/or strategic collaborations. If future financings involve the issuance of equity securities, our existing stockholders would suffer dilution. If we raise debt financing or enter into credit facilities, we may be subject to restrictive covenants that limit our ability to conduct our business. Strategic collaborations may also place restrictions on our business. We may not be able to raise sufficient additional funds on terms that are favorable to us, if at all. If we fail to raise sufficient funds and fail to generate sufficient revenues to achieve planned gross margins and to control operating costs, our ability to fund our operations, take advantage of strategic opportunities, develop products or technologies, or otherwise respond to competitive pressures could be significantly limited. If this happens, we may be forced to delay or terminate research or development programs or the commercialization of products resulting from our technologies, curtail or cease operations or obtain funds through collaborative and licensing arrangements that may require us to relinquish commercial rights, or grant licenses on terms that are not favorable to us. If adequate funds are not available, we will not be able to successfully execute our business plan or continue our business.

We have investments in non-marketable securities, which may subject us to significant impairment charges.

We have investments in illiquid non-marketable equity securities acquired in private transactions. At December 31, 2021, 5.7% of our consolidated assets consisted of investment securities, which are illiquid investments. Investments in illiquid, or non-marketable, securities are inherently risky and difficult to value. We account for our non-marketable equity securities under the measurement alternative. Under the measurement alternative, the carrying value of our non-marketable equity investments is adjusted to fair value for observable transactions for identical or similar investments of the same issuer or impairment. We evaluate our investment in non-marketable securities when circumstances indicate that we may not be able to recover the carrying value. We may impair these securities and establish an allowance for a credit loss when

we determine that there has been an "other-than-temporary" decline in estimated fair value of the equity security compared to its carrying value. The impairment analysis requires significant judgment to identify events or circumstances that would likely have a material adverse effect on the fair value of the investment. Because over 5% of our total assets consisted of non-marketable investment securities, any future impairment charges from the write down in value of these securities could have a material adverse effect on our financial condition or results of operations.

Competitors and potential competitors who have greater resources and experience than we do may develop products and technologies that make ours obsolete or may use their greater resources to gain market share at our expense.

The biocatalysis industry and each of our target markets are characterized by rapid technological change. Our future success will depend on our ability to maintain a competitive position with respect to technological advances. In addition, as we enter new markets, we will face new competition and will need to adapt to competitive factors that may be different from those we face today.

We are aware that other companies, including Royal DSM, N.V. ("DSM"), BASF, Bayer and Novozymes have alternative methods for obtaining and generating genetic diversity or use mutagenesis techniques to produce genetic diversity. Academic institutions such as the California Institute of Technology, the Max Planck Institute and the Austrian Centre of Industrial Biotechnology are also working in this field. Technological development by others may result in our products and technologies, as well as products developed by our customers using our biocatalysts, becoming obsolete.

Our primary competitors in the performance enzymes for pharmaceutical products are companies marketing either conventional, non-enzymatic processes or biocatalytic enzymes to manufacturers of pharmaceutical intermediates and APIs, and also existing in-house technologies (both biocatalysts and conventional catalysts) within our client and potential client companies. The principal methods of competition and competitive differentiation in this market are price, product quality and performance, including manufacturing yield, safety and environmental benefits, and speed of delivery of product. Pharmaceutical manufacturers that use biocatalytic processes can face increased competition from manufacturers that use more conventional processes and/or manufacturers that are based in regions (such as India and China) with lower regulatory, safety and environmental costs.

The market for the manufacture and supply of APIs and intermediates is large with many established companies. These companies include many of our large innovator and generic pharmaceutical customers, such as Merck, GSK, Novartis, Pfizer, Bristol-Myers, Kyorin, Urovant and Teva which have significant internal research and development efforts directed at developing processes to manufacture APIs and intermediates. The processes used by these companies include classical conventional organic chemistry reactions, chemo catalytic reactions, biocatalytic reactions or combinations thereof. Our biocatalytic based manufacturing processes must compete with these internally developed routes. Additionally, we also face competition from companies developing and marketing conventional catalysts such as Solvias Inc., BASF and Takasago International Corporation.

The market for supplying enzymes for use in pharmaceutical manufacturing is quite fragmented. There is competition from large industrial enzyme companies, such as Novozymes, and Dupont, as well as subsidiaries of larger contract research/contract manufacturing organizations ("CRO/CMO"), such as DSM, Cambrex Corporation, Lonza, WuXi STA, and Almac Group Ltd. Some fermentation pathway design companies, like Ginkgo Bioworks and Zymergen, whose traditional focus has been to design microorganisms that express small molecule chemicals, could extend into designing organisms that express enzymes. There is also competition in the enzyme customization and optimization area from several smaller companies, such as BRAIN AG, Arzeda, c-LEcta GmbH and Evocatal GmbH.

We entered the fine chemicals market in 2013, by applying our protein engineering technology in the food market. We face similar forms of competition in this market as in the pharmaceutical markets with the exception that the risk of losing opportunities to larger competitors in fine chemicals is greater given the larger scale of opportunities available in the fine chemicals market compared to the pharmaceutical market. Our significant competitors in the fine chemicals markets include companies that have been in these marketplaces for many years, such as DuPont Industrial Biosciences (DuPont Genencor), DSM, Novozymes and A.B. Enzymes. These companies have greater resources in these markets than we do and have long-term supply arrangements already in place with customers. Our ability to compete in these markets may be limited by our relatively late entrance. We also face competition in both the fine chemicals and pharmaceutical markets from emerging companies offering whole cell metabolic pathway approaches to these markets.

There are numerous companies that participate in the biotherapeutics market generally and the PKU market specifically. Many of these companies are large, successful and well-capitalized. BioMarin Pharmaceutical Inc. ("BioMarin") and Daiichi Sankyo Company market Kuvan® in the United States, Europe and Japan for the treatment of a certain type of PKU. In addition, BioMarin gained US FDA approval in 2018 and began commercial sales of Palynziq™ as

an injectable enzyme substitution therapy for the potential treatment of PKU. Several companies, i.e., Synlogic, Homology Medicines, and Rubius have reported clinical efforts to develop biotherapeutic candidates for PKU. Beyond targeting PKU, Takeda (who recently acquired Shire Plc), Genzyme / Sanofi S.A., BioMarin, and other companies market or are actively developing new enzyme therapeutics. There are numerous companies that are developing other forms of therapeutics, such as small molecules, gene therapies, as well as therapies based on gene editing, which could compete with biotherapeutics.

Our ability to compete successfully in any of these markets will depend on our ability to develop proprietary products that reach the market in a timely manner and are technologically superior to and/or are less expensive than other products on the market. Many of our competitors have substantially greater production, financial, research and development, personnel and marketing resources than we do. They also started developing products earlier than we did, which may allow them to establish blocking intellectual property positions or bring products to market before we can. In addition, certain of our competitors may also benefit from local government subsidies and other incentives that are not available to us. As a result, our competitors may be able to develop competing and/or superior technologies and processes, and compete more aggressively and sustain that competition over a longer period of time than we could. Our technologies and products may be rendered obsolete or uneconomical by technological advances or entirely different approaches developed by one or more of our competitors. We cannot be certain that any products we develop in the future will compare favorably to products offered by our competitors or that our existing or future products will compare favorably to any new products that are developed by our competitors. As more companies develop new intellectual property in our markets, the possibility of a competitor acquiring patent or other rights that may limit our products or potential products increases, which could lead to litigation.

Our limited resources relative to many of our competitors may cause us to fail to anticipate or respond adequately to new developments and other competitive pressures. This failure could reduce our competitiveness and market share, adversely affect our results of operations and financial position, and prevent us from obtaining or maintaining profitability.

Ethical, legal and social concerns about genetically engineered products and processes could limit or prevent the use of our products, processes, and technologies and limit our revenues.

Some of our products and processes are genetically engineered or involve the use of genetically engineered products or genetic engineering technologies. If we and/or our collaborators are not able to overcome the ethical, legal, and social concerns relating to genetic engineering, our products and processes may not be accepted. Any of the risks discussed below could result in increased expenses, delays, or other impediments to our programs or the public acceptance and commercialization of products and processes dependent on our technologies or inventions. Our ability to develop and commercialize one or more of our technologies, products, or processes could be limited by the following factors:

- public attitudes about the safety and environmental hazards of, and ethical concerns over, genetic research and genetically engineered products and processes, which could influence public acceptance of our technologies, products and processes;
- public attitudes regarding, and potential changes to laws governing ownership of genetic material, which could harm our intellectual property rights with respect to our genetic material and discourage collaborators from supporting, developing, or commercializing our products, processes and technologies; and
- governmental reaction to negative publicity concerning genetically modified organisms, which could result in greater government regulation of genetic research and derivative products. The subject of genetically modified organisms has received negative publicity, which has aroused public debate. This adverse publicity could lead to greater regulation and trade restrictions on imports of genetically altered products. The biocatalysts that we develop have significantly enhanced characteristics compared to those found in naturally occurring enzymes or microbes. While we produce our biocatalysts only for use in a controlled industrial environment, the release of such biocatalysts into uncontrolled environments could have unintended consequences. Any adverse effect resulting from such a release could have a material adverse effect on our business and financial condition, and we may have exposure to liability for any resulting harm.

If we engage in any acquisitions, we will incur a variety of costs and may potentially face numerous risks that could adversely affect our business and operations.

We have made acquisitions in the past, and if appropriate opportunities become available, we expect to acquire additional businesses, assets, technologies, or products to enhance our business in the future. For example, in October 2010, we acquired substantially all of the patents and other intellectual property rights associated with Maxygen's directed evolution technology.

In connection with any future acquisitions, we could:

- issue additional equity securities, which would dilute our current stockholders;
- incur substantial debt to fund the acquisitions;
- use our cash to fund the acquisitions; or
- assume significant liabilities including litigation risk.

Acquisitions involve numerous risks, including problems integrating the purchased operations, technologies or products, unanticipated costs and other liabilities, diversion of management's attention from our core businesses, adverse effects on existing business relationships with current and/or prospective collaborators, customers and/or suppliers, risks associated with entering markets in which we have no or limited prior experience and potential loss of key employees. We do not have extensive experience in managing the integration process and we may not be able to successfully integrate any businesses, assets, products, technologies, or personnel that we might acquire in the future without a significant expenditure of operating, financial and management resources, if at all. The integration process could divert management's time from focusing on operating our business, result in a decline in employee morale and cause retention issues to arise from changes in compensation, reporting relationships, future prospects or the direction of the business. Acquisitions may also require us to record goodwill and non-amortizable intangible assets that will be subject to impairment testing on a regular basis and potential periodic impairment charges, incur amortization expenses related to certain intangible assets, and incur large and immediate write offs and restructuring and other related expenses, all of which could harm our operating results and financial condition. In addition, we may acquire companies that have insufficient internal financial controls, which could impair our ability to integrate the acquired company and adversely impact our financial reporting. If we fail in our integration efforts with respect to any of our acquisitions and are unable to efficiently operate as a combined organization, our business and financial condition may be adversely affected.

We use hazardous materials in our business and we must comply with environmental laws and regulations. Any claims relating to improper handling, storage or disposal of these materials or noncompliance of applicable laws and regulations could be time consuming and costly and could adversely affect our business and results of operations.

Our research and development and commercial processes involve the use of hazardous materials, including chemical, radioactive, and biological materials. Our operations also produce hazardous waste. We cannot eliminate entirely the risk of accidental contamination or discharge and any resultant injury from these materials. Federal, state, local and foreign laws and regulations govern the use, manufacture, storage, handling and disposal of, and human exposure to, these materials. We may be sued for any injury or contamination that results from our use or the use by third parties of these materials, and our liability may exceed our total assets. Although we believe that our activities comply in all material respects with environmental laws, there can be no assurance that violations of environmental, health and safety laws will not occur in the future as a result of human error, accident, equipment failure or other causes. Compliance with applicable environmental laws and regulations may be expensive, and the failure to comply with past, present, or future laws could result in the imposition of fines, third party property damage, product liability and personal injury claims, investigation and remediation costs, the suspension of production, or a cessation of operations, and our liability may exceed our total assets. Liability under environmental laws can be joint and several and without regard to comparative fault. Environmental laws could become more stringent over time imposing greater compliance costs and increasing risks and penalties associated with violations, which could impair our research, development or production efforts and harm our business. In addition, we may have to indemnify some of our customers or suppliers for losses related to our failure to comply with environmental laws, which could expose us to significant liabilities.

Our ability to use our net operating loss carryforwards to offset future taxable income may be subject to certain limitations.

In general, under Section 382 of the Internal Revenue Code of 1986, as amended (the "Code"), a corporation that undergoes an "ownership change" is subject to limitations on its ability to utilize its pre-change net operating loss carryforwards ("NOLs"), to offset future taxable income. If the Internal Revenue Service challenges our analysis that our existing NOLs are not subject to limitations arising from previous ownership changes, our ability to utilize NOLs could be limited by Section 382 of the Code. Future changes in our stock ownership, some of which are outside of our control, could result in an ownership change under Section 382 of the Code. Furthermore, our ability to utilize NOLs of companies that we may acquire in the future may be subject to limitations. For these reasons, we may not be able to utilize a material portion of the NOLs reflected in our financial statements, even if we attain profitability.

Risks Related to Government Regulation and Clinical Product Development

We or our customers may not be able to obtain regulatory approval for the use of our products in food and food ingredients, if required, and, even if approvals are obtained, complying on an ongoing basis with the numerous regulatory requirements applicable to these products will be time-consuming and costly.

The products that we develop for our food and food ingredient customers are, and any other products that we may develop for the food and food ingredients market will likely be, subject to regulation by various government agencies, including the FDA, state and local agencies and similar agencies outside the United States, as well as religious compliance certifying organizations. Food ingredients are regulated by the FDA either as food additives or as substances generally recognized as safe ("GRAS"). A substance can be listed or affirmed as GRAS by the FDA or self-affirmed by its manufacturer upon determination that independent qualified experts would generally agree that the substance is GRAS for a particular use. While we generally self-affirm GRAS status for the ingredients used in the products that we develop for the food market, our customer(s) may be required to submit a GRAS notification to FDA to establish that ingredients in a final commercial product may be considered GRAS. There can be no assurance that our customer(s) will not receive any objections from the FDA with respect to any GRAS notification our customer(s) may submit. If the FDA were to disagree with our customer's determination that their commercial product and/or its ingredients are GRAS or otherwise compliant, the FDA could ask such customer to voluntarily withdraw the final commercial product from the market or could initiate legal action to halt its sale. Such actions by the FDA could have an adverse effect on our business, financial condition, and results of our operations. Food ingredients that are not GRAS are regulated as food additives and require FDA approval prior to commercialization or must be the subject of an existing food additive regulation. The food additive petition process for ingredients that are not already authorized by regulation is generally expensive and time consuming, with approval, if secured, potentially taking years.

Our ongoing efforts to deploy our technology in the life science tools markets may fail.

We have recently begun to use our CodeEvolver® protein engineering technology platform to develop new products for customers using NGS and PCR/qPCR for *in vitro* molecular diagnostic applications. while we have entered into some license agreements for products in this market, we do not know if we can successfully compete in this new market. This new market is well established and consists of numerous large, well-funded entrenched market participants who have long and established track records and customer relationships. In December 2019, we licensed our first proprietary enzyme for this market, EvoT4™ DNA ligase, which is designed to improve library preparation for NGS users, to Roche. This enzyme, and any products that we may develop in the future for this market, may not succeed in displacing current products. If we succeed in commercializing new products for this market, we may not generate significant revenues and cash flows from these activities. The failure to successfully deploy products on timely basis in this space may limit our growth and have a material adverse effect on our financial condition, operating results and business prospects.

The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time consuming and inherently unpredictable, and if we are ultimately unable to obtain regulatory approval for our product candidates, our business will be substantially harmed.

We and any collaborators are not permitted to commercialize, market, promote or sell any product candidate in the United States without obtaining marketing approval from the FDA. Foreign regulatory authorities impose similar requirements. The time required to obtain approval by the FDA and comparable foreign authorities is unpredictable, but typically takes many years following the commencement of clinical trials and depends upon numerous factors, including substantial discretion of the regulatory authorities. In addition, approval policies, regulations or the type and amount of clinical data necessary to gain approval may change during the course of a product candidate's clinical development and may vary among jurisdictions. To date, neither we nor our collaborators have submitted a BLA to FDA or similar drug approval submissions to comparable foreign regulatory authorities for any product candidate. We and any collaborators must complete additional preclinical or nonclinical studies and clinical trials to demonstrate the safety, purity and potency (or efficacy) of our product candidates in humans to the satisfaction of the regulatory authorities before we will be able to obtain these approvals. Our product candidates could fail to receive regulatory approval for many reasons, including the following:

- the FDA or comparable foreign regulatory authorities may disagree with the design or implementation of our or our collaborators' clinical trials;
- we or our collaborators may be unable to demonstrate to the satisfaction of the FDA or comparable foreign regulatory authorities that a product candidate is safe and effective for its proposed indication;

- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for approval;
- we or our collaborators may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- the FDA or comparable foreign regulatory authorities may disagree with our or our collaborators' interpretation of data from preclinical studies or clinical trials;
- the data collected from clinical trials of product candidates may not be sufficient to support the submission of a BLA to obtain regulatory approval in the United States or elsewhere;
- the FDA or comparable foreign regulatory authorities may fail to approve the manufacturing processes or facilities of third-party manufacturers with which we or our collaborators contract for clinical and commercial supplies;
- the FDA or comparable foreign regulatory authorities may fail to approve the companion diagnostics we contemplate developing with collaborators; and
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our or our collaborators' clinical data insufficient for approval.

This lengthy approval process as well as the unpredictability of future clinical trial results may result in our failing to obtain regulatory approval to market our product candidates, which would significantly harm our business, results of operations and prospects. In addition, even if we were to obtain approval, regulatory authorities may approve any of our product candidates for fewer or more limited indications than we request, may impose significant limitations in the form of narrow indications, warnings, or a REMS. Regulatory authorities may not approve the price we or our collaborators intend to charge for products we may develop, may grant approval contingent on the performance of costly post-marketing clinical trials, or may approve a product candidate with a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates.

Clinical trials are difficult to design and implement, expensive, time-consuming and involve an uncertain outcome, and the inability to successfully conduct clinical trials and obtain regulatory approval for our product candidates would substantially harm our business.

Clinical testing is expensive and usually takes many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the clinical trial process, and product candidates in later stages of clinical trials may fail to show the desired safety and efficacy traits despite having progressed through preclinical studies and initial clinical trials. We do not know whether planned clinical trials will begin on time, need to be redesigned, recruit and enroll patients on time or be completed on schedule, or at all. Clinical trials can be delayed, suspended or terminated for a variety of reasons, including in connection with:

- the inability to generate sufficient preclinical, toxicology or other *in vivo* or *in vitro* data to support the initiation of clinical trials;
- applicable regulatory authorities disagreeing as to the design or implementation of the clinical trials;
- obtaining regulatory authorization to commence a trial;
- reaching an agreement on acceptable terms with prospective contract research organizations ("CROs"), and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- obtaining IRB approval at each site;
- developing and validating the companion diagnostic to be used in a clinical trial, if applicable;
- insufficient or inadequate supply or quality of product candidates or other materials necessary for use in clinical trials, or delays in sufficiently developing, characterizing or controlling a manufacturing process suitable for clinical trials;
- recruiting and retaining enough suitable patients to participate in a trial;
- having enough patients complete a trial or return for post-treatment follow-up;
- adding a sufficient number of clinical trial sites;

- inspections of clinical trial sites or operations by applicable regulatory authorities, or the imposition of a clinical hold;
- clinical sites deviating from trial protocol or dropping out of a trial;
- the inability to demonstrate the efficacy and benefits of a product candidate;
- discovering that product candidates have unforeseen safety issues, undesirable side effects or other unexpected characteristics;
- addressing patient safety concerns that arise during the course of a trial; receiving untimely or unfavorable feedback from applicable regulatory authorities regarding the trial or requests from regulatory authorities to modify the design of a trial;
- non-compliance with applicable regulatory requirements by us or third parties or changes in such regulations or administrative actions;
- suspensions or terminations by IRBs of the institutions at which such trials are being conducted, by the Data Safety Monitoring Board for such trial or by the FDA or other regulatory authorities due to a number of factors, including those described above;
- third parties being unable or unwilling to satisfy their contractual obligations to us; or
- changes in our financial priorities, greater than anticipated costs of completing a trial or our inability to continue funding the trial.

In addition, disruptions caused by the COVID-19 pandemic may increase the likelihood that we encounter such difficulties or delays in initiating, enrolling, conducting or completing our planned and ongoing clinical trials. Many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates. Additionally, we or our collaborators may experience unforeseen events during or resulting from clinical trials that could delay or prevent receipt of marketing approval for or commercialization of product candidates. For example, clinical trials of product candidates may produce negative, inconsistent or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon development programs. Regulators may also revise the requirements for approving the product candidates, or such requirements may not be as we anticipate. If we or our collaborators are required to conduct additional clinical trials or other testing of product candidates beyond those that we or our collaborators currently contemplate, if we or our collaborators are unable to successfully complete clinical trials or other testing of such product candidates, if the results of these trials or tests are not positive or are only modestly positive or if there are safety concerns, we may:

- incur unplanned costs;
- be delayed in obtaining or fail to obtain marketing approval for product candidates;
- obtain marketing approval in some countries and not in others;
- obtain marketing approval for indications or patient populations that are not as broad as intended or desired;
- obtain marketing approval with labeling that includes significant use or distribution restrictions or safety warnings, including boxed warnings;
- be subject to additional post-marketing testing requirements;
- be subject to changes in the way the product is administered;
- have regulatory authorities withdraw or suspend their approval of the product or impose restrictions on its distribution;
- be sued; or
- experience damage to our reputation.

If we or our collaborators experience delays in the commencement or completion of our clinical trials, or if we or our collaborators terminate a clinical trial prior to completion, we may experience increased costs, have difficulty raising capital and/or be required to slow down the development and approval process timelines. Furthermore, the product candidates that are the subject of such trials may never receive regulatory approval, and their commercial prospects and our ability to generate product revenues from them could be impaired or not realized at all.

Results of preclinical studies and early clinical trials of product candidates may not be predictive of results of later studies or trials. Our product candidates may not have favorable results in later clinical trials, if any, or receive regulatory approval.

Preclinical and clinical drug development is expensive and can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the preclinical study or clinical trial process. Despite promising preclinical or clinical results, any product candidate can unexpectedly fail at any stage of preclinical or clinical development. The historical failure rate for product candidates in our industry is high. The results from preclinical studies or early clinical trials of a product candidate may not be predictive of the results from later preclinical studies or clinical trials, and interim results of a clinical trial are not necessarily indicative of final results. Product candidates in later stages of clinical trials may fail to show the desired safety and efficacy characteristics despite having progressed through preclinical studies and initial clinical trials.

Many companies in the biopharmaceutical and biotechnology industries have suffered significant setbacks at later stages of development after achieving positive results in early stages of development, and we may face similar setbacks. These setbacks have been caused by, among other things, preclinical findings made while clinical trials were underway or safety or efficacy observations made in clinical trials, including previously unreported adverse events. Moreover, non-clinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that believed their product candidates performed satisfactorily in preclinical studies and clinical trials nonetheless failed to obtain regulatory approval. Even if any product candidates progress to clinical trials, these product candidates may fail to show the safety and efficacy in clinical development required to obtain regulatory approval, despite the observation of positive results in animal studies. Our or our collaborators' failure to replicate positive results from early research programs and preclinical or greenhouse studies may prevent us from further developing and commercializing those or other product candidates, which would limit our potential to generate revenues from them and harm our business and prospects.

For the foregoing reasons, we cannot be certain that any ongoing or future preclinical studies or clinical trials will be successful. Any safety or efficacy concerns observed in any one of our preclinical studies or clinical trials in a targeted area could limit the prospects for regulatory approval of product candidates in that and other areas, which could have a material adverse effect on our business and prospects.

Even if we obtain regulatory approval for any products that we develop alone or with collaborators, such products will remain subject to ongoing regulatory requirements, which may result in significant additional expense.

Even if products we develop alone or with collaborators receive regulatory approval, they will be subject to ongoing regulatory requirements for manufacturing, labeling, packaging, distribution, storage, advertising, promotion, sampling, record-keeping and submission of safety and other post-market information, among other things. Any regulatory approvals received for such products may also be subject to limitations on the approved indicated uses for which they may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing and surveillance studies. For example, the holder of an approved BLA in the United States is obligated to monitor and report adverse events and any failure of a product to meet the specifications in the BLA. In the United States, the holder of an approved BLA must also submit new or supplemental applications and obtain FDA approval for certain changes to the approved product, product labeling or manufacturing process. Similar provisions apply in the European Union. Advertising and promotional materials must comply with FDA rules and are subject to FDA review, in addition to other potentially applicable federal and state laws. Similarly, in the European Union any promotion of medicinal products is highly regulated and, depending on the specific jurisdiction involved, may require prior vetting by the competent national regulatory authority. In addition, product manufacturers and their facilities are subject to payment of user fees and continual review and periodic inspections by the FDA and other regulatory authorities for compliance with cGMP requirements and adherence to commitments made in the BLA or foreign marketing application.

If we, our collaborators or a regulatory agency discovers previously unknown problems with a product such as adverse events of unanticipated severity or frequency or problems with the facility where the product is manufactured or disagrees with the promotion, marketing or labeling of that product, a regulatory agency may impose restrictions relative to that product, the manufacturing facility or us or our collaborators, including requiring recall or withdrawal of the product from the market or suspension of manufacturing.

Moreover, if any of our product candidates are approved, our product labeling, advertising, promotion and distribution will be subject to regulatory requirements and continuing regulatory review. The FDA strictly regulates the promotional claims that may be made about drug products. In particular, a product may not be promoted for uses that are not approved by the FDA as reflected in the product's approved labeling. If we or our collaborators fail to comply with applicable regulatory requirements following approval of any potential products we may develop, authorities may:

- issue an untitled enforcement letter or a warning letter asserting a violation of the law;
- seek an injunction, impose civil and criminal penalties, and impose monetary fines, restitution or disgorgement of profits or revenues;
- suspend or withdraw regulatory approval;
- suspend or terminate any ongoing clinical trials or implement requirements to conduct post-marketing studies or clinical trials;
- refuse to approve a pending BLA or comparable foreign marketing application (or any supplements thereto) submitted by us or our collaborators;
- restrict the labeling, marketing, distribution, use or manufacturing of products;
- seize or detain products or otherwise require the withdrawal or recall of products from the market;
- refuse to approve pending applications or supplements to approved applications that we or our collaborators submit;
- refuse to permit the import or export of products; or
- refuse to allow us or our collaborators to enter into government contracts.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response and could generate negative publicity. The occurrence of any event or penalty described above may inhibit our or our collaborators' ability to commercialize products and our ability to generate revenues.

In addition, the FDA's policies, and policies of foreign regulatory agencies, may change, and additional regulations may be enacted that could prevent, limit or delay regulatory approval of product candidates. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may be subject to enforcement action and we may not achieve or sustain profitability.

Our business operations and future relationships with investigators, healthcare professionals, consultants, third-party payors, patient organizations and customers will be subject to applicable healthcare regulatory laws, which could expose us to penalties.

Our business operations and future arrangements with investigators, healthcare professionals, consultants, third-party payors, patient organizations and customers, may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations. These laws may constrain the business or financial arrangements and relationships through which we will conduct our operations, including how we research, market, sell and distribute our product candidates, if approved. Such laws include:

- the U.S. federal Anti-Kickback Statute, which prohibits, among other things, persons or entities from knowingly and willfully soliciting, offering, receiving or providing any remuneration (including any kickback, bribe, or certain rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, lease, order or recommendation of, any good, facility, item or service, for which payment may be made, in whole or in part, under U.S. federal and state healthcare programs such as Medicare and Medicaid. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- the U.S. federal false claims laws, including the civil False Claims Act, which, among other things, impose criminal and civil penalties, including through civil whistleblower or qui tam actions, against individuals or entities for knowingly presenting, or causing to be presented, to the U.S. federal government, claims for payment or approval that are false or fraudulent, knowingly making, using or causing to be made or used, a false record or statement material to a false or fraudulent claim, or from knowingly making a false statement to avoid, decrease or conceal an obligation to pay money to the U.S. federal government. In addition, the government may assert that a claim including items and services resulting from a violation of the U.S. federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the False Claims Act;
- the U.S. federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), which imposes criminal and civil liability for, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, or knowingly and willfully falsifying,

concealing or covering up a material fact or making any materially false statement, in connection with the delivery of, or payment for, healthcare benefits, items or services; similar to the U.S. federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;

- the U.S. federal Physician Payments Sunshine Act, which requires certain manufacturers of drugs, devices, biologics and medical supplies that are reimbursable under Medicare, Medicaid, or the Children's Health Insurance Program to report annually to the government information related to certain payments and other transfers of value to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors), certain non-physician practitioners such as physician assistants and nurse practitioners, and teaching hospitals, as well as ownership and investment interests held by the physicians described above and their immediate family members;
- analogous U.S. state laws and regulations, including: state anti-kickback and false claims laws, which may apply to our future business practices, including but not limited to, research, distribution, sales and marketing arrangements and claims involving healthcare items or services reimbursed by any third-party payor, including private insurers; state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the U.S. federal government, or otherwise restrict payments that may be made to healthcare providers and other potential referral sources; state laws and regulations that require drug manufacturers to file reports relating to pricing and marketing information, which requires tracking gifts and other remuneration and items of value provided to healthcare professionals and entities; and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts; and
- similar healthcare laws and regulations in the EU and other jurisdictions, including reporting requirements detailing interactions with and payments to healthcare providers and laws governing the privacy and security of certain protected information, such as the General Data Protection Regulation ("GDPR"), which imposes obligations and restrictions on the collection and use of personal data relating to individuals located in the European Economic Area ("EEA") (including health data).

Ensuring that our internal operations and future business arrangements with third parties comply with applicable healthcare laws and regulations will involve substantial costs. It is possible that governmental authorities will conclude that our business practices do not comply with current or future statutes, regulations, agency guidance or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any of the laws described above or any other governmental laws and regulations that may apply to us, we may be subject to significant penalties, including civil, criminal and administrative penalties, damages, fines, exclusion from government-funded healthcare programs, such as Medicare and Medicaid or similar programs in other countries or jurisdictions, disgorgement, individual imprisonment, contractual damages, reputational harm, diminished profits and the curtailment or restructuring of our operations.

The successful commercialization of product candidates developed by us or our partners will depend in part on the extent to which governmental authorities and health insurers establish adequate coverage, reimbursement levels and pricing policies. Failure to obtain or maintain coverage and adequate reimbursement for such product candidates, if approved, could limit our or our partners' ability to market those products and decrease our ability to generate revenue.

The availability and adequacy of coverage and reimbursement by governmental healthcare programs such as Medicare and Medicaid, private health insurers and other third-party payors are essential for most patients to be able to afford prescription medications such as our product candidates, assuming FDA approval. Our ability to achieve acceptable levels of coverage and reimbursement for products by governmental authorities, private health insurers and other organizations will have an effect on our ability to successfully commercialize our product candidates. Assuming we obtain coverage for our product candidates by a third-party payor, the resulting reimbursement payment rates may not be adequate or may require co-payments that patients find unacceptably high. We cannot be sure that coverage and reimbursement in the United States, the EU or elsewhere will be available for our product candidates or any product that we may develop, and any reimbursement that may become available may be decreased or eliminated in the future.

Third-party payors increasingly are challenging prices charged for pharmaceutical products and services, and many third-party payors may refuse to provide coverage and reimbursement for particular drugs or biologics when an equivalent generic drug, biosimilar or a less expensive therapy is available. It is possible that a third-party payor may consider our product candidates as substitutable and only offer to reimburse patients for the less expensive product. Even if we show improved efficacy or improved convenience of administration with our product candidates, pricing of existing third-party

therapeutics may limit the amount we will be able to charge for our product candidates. These payors may deny or revoke the reimbursement status of a given product or establish prices for new or existing marketed products at levels that are too low to enable us to realize an appropriate return on our investment in our product candidates. For products administered under the supervision of a physician, obtaining coverage and adequate reimbursement may be particularly difficult because of the higher prices often associated with such drugs. Additionally, separate reimbursement for the product itself or the treatment or procedure in which the product is used may not be available, which may impact physician utilization. If reimbursement is not available or is available only at limited levels, we may not be able to successfully commercialize our product candidates, and may not be able to obtain a satisfactory financial return on our product candidates.

No uniform policy for coverage and reimbursement for products exists among third-party payors in the United States. Therefore, coverage and reimbursement for products can differ significantly from payor to payor. As a result, the coverage determination process is often a time-consuming and costly process that will require us to provide scientific and clinical support for the use of our product candidates to each payor separately, with no assurance that coverage and adequate reimbursement will be applied consistently or obtained in the first instance. Furthermore, rules and regulations regarding reimbursement change frequently, in some cases on short notice, and we believe that changes in these rules and regulations are likely.

Outside the United States, international operations are generally subject to extensive governmental price controls and other market regulations, and we believe the increasing emphasis on cost-containment initiatives in Europe and other countries have and will continue to put pressure on the pricing and usage of our product candidates. In many countries, the prices of medical products are subject to varying price control mechanisms as part of national health systems. Other countries allow companies to fix their own prices for medical products, but monitor and control company profits. Additional foreign price controls or other changes in pricing regulation could restrict the amount that we are able to charge for our product candidates. Accordingly, in markets outside the United States, the reimbursement for our product candidates may be reduced compared with the United States and may be insufficient to generate commercially-reasonable revenue and profits.

Moreover, increasing efforts by governmental and third-party payors in the United States and abroad to cap or reduce healthcare costs may cause such organizations to limit both coverage and the level of reimbursement for newly approved products and, as a result, they may not cover or provide adequate payment for our product candidates. We expect to experience pricing pressures in connection with the sale of our product candidates due to the trend toward managed health care, the increasing influence of health maintenance organizations and additional legislative changes. The downward pressure on healthcare costs in general, particularly prescription drugs and biologics and surgical procedures and other treatments, has become intense. As a result, increasingly high barriers are being erected to the entry of new products.

Compliance with European Union chemical regulations could be costly and adversely affect our business and results of operations.

Some of our products are subject to the European Union regulatory regime known as The Registration, Evaluation and Authorization of Chemicals ("REACH"). REACH mandates that certain chemicals manufactured in, or imported into, the European Union be registered and evaluated for their potential effects on human health and the environment. Under REACH, we and our contract manufacturers located in the European Union are required to register certain of our products based on the quantity of such product imported into or manufactured in the European Union and on the product's intended end-use. The registration, evaluation and authorization process under REACH can be costly and time consuming. Problems or delays in the registration, evaluation or authorization process under REACH could delay or prevent the manufacture of some of our products in, or the importation of some of our products into, the European Union, which could adversely affect our business and results of operations. In addition, if we or our contract manufacturers fail to comply with REACH, we may be subject to penalties or other enforcement actions, which could have a material adverse effect on our business and results of operations.

Risks Related to our Dependence on Third Parties

We rely on third parties to conduct our clinical trials and perform some of our research and preclinical studies. If these third parties do not satisfactorily carry out their contractual duties or fail to meet expected deadlines, our development programs may be delayed or subject to increased costs, each of which may have an adverse effect on our business and prospects.

We do not have the ability to conduct all aspects of our preclinical testing or clinical trials ourselves. As a result, we are and expect to remain dependent on third parties to conduct clinical trials of our product candidates. Specifically, we expect CROs, clinical investigators, and consultants to play a significant role in the conduct of these trials and the

subsequent collection and analysis of data. However, we will not be able to control all aspects of their activities. Nevertheless, we are responsible for ensuring that each of our trials is conducted in accordance with the applicable protocol and legal, regulatory and scientific standards, and our reliance on the CROs and other third parties does not relieve us of our regulatory responsibilities. We and our CROs are required to comply with GCP requirements, which are regulations and guidelines enforced by the FDA and comparable foreign regulatory authorities for all of our product candidates in clinical development. Regulatory authorities enforce these GCP requirements through periodic inspections of trial sponsors, clinical trial investigators and clinical trial sites. If we or any of our CROs or clinical trial sites fail to comply with applicable GCP requirements, the data generated in our clinical trials may be deemed unreliable, and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. In addition, our clinical trials must be conducted with product produced under cGMP regulations. Our failure to comply with these regulations may require us to stop and/or repeat clinical trials, which would delay the marketing approval process.

There is no guarantee that any such CROs, clinical trial investigators or other third parties on which we rely will devote adequate time and resources to our development activities or perform as contractually required. If any of these third parties fail to meet expected deadlines, adhere to our clinical protocols or meet regulatory requirements, otherwise performs in a substandard manner, or terminates its engagement with us, the timelines for our development programs may be extended or delayed or our development activities may be suspended or terminated. If any of our clinical trial sites terminates for any reason, we may experience the loss of follow-up information on subjects enrolled in such clinical trials unless we are able to transfer those subjects to another qualified clinical trial site, which may be difficult or impossible. In addition, clinical trial investigators for our clinical trials may serve as scientific advisors or consultants to us from time to time and may receive cash or equity compensation in connection with such services. If these relationships and any related compensation result in perceived or actual conflicts of interest, or the FDA or comparable foreign regulatory authorities concludes that the financial relationship may have affected the interpretation of the trial, the integrity of the data generated at the applicable clinical trial site may be questioned and the utility of the clinical trial itself may be jeopardized, which could result in the delay or rejection of any marketing application we submit by the FDA or any comparable foreign regulatory authority. Any such delay or rejection could prevent us from commercializing our product candidates.

We contract with third parties for the manufacturing and supply of product candidates for use in preclinical testing and clinical trials and related services, which supply may become limited or interrupted or may not be of satisfactory quality and quantity.

We do not have any manufacturing facilities. We produce in our laboratory relatively small quantities of products for evaluation in our research programs. We rely, and expect to continue to rely, on third parties for the manufacture of our product candidates for preclinical and clinical testing, as well as for commercial manufacture if any of our product candidates are approved. We currently have limited manufacturing arrangements and expect that each of our product candidates will only be covered by single source suppliers for the foreseeable future. This reliance increases the risk that we will not have sufficient quantities of our product candidates or products, if approved, or such quantities at an acceptable cost or quality, which could delay, prevent or impair our development or commercialization efforts.

Furthermore, all entities involved in the preparation of therapeutics for clinical trials or commercial sale, including our existing contract manufacturers for our product candidates, are subject to extensive regulation. Components of a finished therapeutic product approved for commercial sale or used in clinical trials must be manufactured in accordance with cGMP requirements. These regulations govern manufacturing processes and procedures, including record keeping, and the implementation and operation of quality systems to control and assure the quality of investigational products and products approved for sale. Poor control of production processes can lead to the introduction of contaminants, or to inadvertent changes in the properties or stability of our product candidates that may not be detectable in final product testing. We or our contract manufacturers must supply all necessary documentation in support of a BLA on a timely basis and must adhere to the FDA's cGMP regulations enforced by the FDA through its facilities inspection program. Comparable foreign regulatory authorities may require compliance with similar requirements. The facilities and quality systems of our third-party contractor manufacturers must pass a pre-approval inspection for compliance with the applicable regulations as a condition of marketing approval of our product candidates. We do not control the manufacturing activities of, and are completely dependent on, our contract manufacturers for compliance with cGMP regulations.

In the event that any of our manufacturers fails to comply with such requirements or to perform its obligations to us in relation to quality, timing or otherwise, or if our supply of components or other materials becomes limited or interrupted for other reasons, we may be forced to manufacture the materials ourselves, for which we currently do not have the capabilities or resources, or enter into an agreement with another third party, which we may not be able to do on commercially reasonable terms, if at all. In particular, any replacement of our manufacturers could require significant effort

and expertise because there may be a limited number of qualified replacements. In some cases, the technical skills or technology required to manufacture our product candidates may be unique or proprietary to the original manufacturer and we may have difficulty transferring such skills or technology to another third party and a feasible alternative may not exist. In addition, certain of our product candidates and our own proprietary methods have never been produced or implemented outside of our company, and we may therefore experience delays to our development programs if and when we attempt to establish new third party manufacturing arrangements for these product candidates or methods. These factors would increase our reliance on such manufacturer or require us to obtain a license from such manufacturer in order to have another third party manufacture our product candidates. If we are required to change manufacturers for any reason, we will be required to verify that the new manufacturer maintains facilities and procedures that comply with quality standards and with all applicable regulations and guidelines. The delays associated with the verification of a new manufacturer could negatively affect our ability to develop product candidates in a timely manner or within budget.

Our or a third party's failure to execute on our manufacturing requirements, do so on commercially reasonable terms and comply with cGMP could adversely affect our business in a number of ways, including:

- an inability to initiate or continue clinical trials of our product candidates under development;
- delay in submitting regulatory applications, or receiving marketing approvals, for our product candidates;
- loss of the cooperation of future collaborators;
- subjecting third-party manufacturing facilities or our manufacturing facilities to additional inspections by regulatory authorities;
- requirements to cease development or to recall batches of our product candidates; and
- in the event of approval to market and commercialize our product candidates, an inability to meet commercial demands for our product or any other future product candidates.

Risks Related to Intellectual Property and Information Technology

Our efforts to prosecute and protect our intellectual property may not be successful.

We will continue to file and prosecute patent applications and maintain trade secrets in an ongoing effort to protect our intellectual property. It is possible that our current patents, or patents which we may later acquire, may be successfully challenged or invalidated in whole or in part. It is also possible that we may not obtain issued patents from our pending patent applications or other inventions we seek to protect. We sometimes permit certain patents or patent applications to lapse or go abandoned under appropriate circumstances. Due to uncertainties inherent in prosecuting patent applications, sometimes patent applications are rejected, and we subsequently abandon them. It is also possible that we may develop proprietary products or technologies in the future that are not patentable or that the patents of others will limit or altogether preclude our ability to conduct business. In addition, any patent issued to us or to our licensor may provide us with little or no competitive advantage, in which case we may abandon such patent or license it to another entity, or terminate the license agreement.

Our means of protecting our proprietary rights may not be adequate and our competitors may independently develop technology or products that are similar to ours or that compete with ours. Patent, trademark, copyright and trade secret laws afford only limited protection for our technology platform, services and products. The laws of many countries do not protect our proprietary rights to as great an extent as do the laws of the United States. Despite our efforts to protect our proprietary rights, unauthorized parties have in the past attempted, and may in the future attempt, to operate under aspects of our intellectual property, technology, services or products or to obtain and use information that we regard as proprietary. Third parties may also design around our proprietary rights, which may render our protected technology, services and products less valuable, if the design around is favorably received in the marketplace. In addition, if any of our products, services or technology is covered by third-party patents or other intellectual property rights, we could be subject to various legal actions. We cannot assure you that our technology platform, services and products do not infringe patents held by others or that they will not in the future.

Litigation may be necessary to enforce our intellectual property rights, to protect our trade secrets, to determine the validity and scope of the proprietary rights of others, or to defend against claims of infringement, invalidity, misappropriation, or other claims.

Any such litigation could result in substantial costs and diversion of our resources. Moreover, any settlement of or adverse judgment resulting from litigation relating to intellectual property could require us to obtain a license to continue to

make, use or sell the products or technology that is the subject of the claim, or otherwise restrict or prohibit our use of the technology, product or services.

Our ability to compete may decline if we do not adequately protect our proprietary technologies or if we lose some of our intellectual property rights.

Our success depends in part on our ability to obtain patents and maintain adequate protection of our intellectual property for our technologies, services and products in the United States and other countries. We have adopted a strategy of seeking patent protection in the United States and in foreign countries with respect to certain of the technologies used in or relating to our services, products and processes. As such, as of December 31, 2021, we owned or controlled approximately 1,900 issued patents and pending patent applications in the United States and in various foreign jurisdictions. Our patents and patent applications, if issued, as of December 31, 2021, have terms that expire between 2022 and approximately 2042. We also have license rights to a number of issued patents and pending patent applications in the United States and in various foreign jurisdictions. Our owned and licensed patents and patent applications include those directed to our enabling technologies and to the methods and products that support our business in the biotherapeutics, molecular diagnostics, food and other markets. We intend to continue to apply for patents relating to our technologies, methods, services and products as we deem appropriate.

Issuance of claims in patent applications and enforceability of such claims once issued involve complex legal and factual questions and, therefore, we cannot predict with any certainty whether any of our issued patents will survive invalidity claims asserted by third parties. Issued patents and patents issuing from pending applications may be challenged, invalidated, or circumvented. Moreover, the United States Leahy-Smith America Invents Act ("AIA"), enacted in September 2011, brought significant changes to the United States patent system, which include a change to a "first to file" system from a "first to invent" system and changes to the procedures for challenging issued patents and disputing patent applications during the examination process, among other things. While interference proceedings are possible for patent claims filed prior to March 16, 2013, many of our filings will be subject to the post- and pre-grant proceedings set forth in the AIA, including citation of prior art and written statements by third parties, third party pre-issuance submissions, ex parte reexamination, inter partes review, post-grant review, and derivation proceedings. We may need to utilize the processes provided by the AIA for supplemental examination or patent reissuance. These proceedings could result in substantial cost to us even if the outcome is favorable. Even if successful, any interference may result in loss of certain claims. Any litigation or proceedings could divert our management's time and efforts. Even unsuccessful claims brought by third parties could result in significant legal fees and other expenses, diversion of management time, and disruption in our business. Uncertainties resulting from initiation and continuation of any patent or related litigation could harm our ability to compete. We have not assessed the applicability of the AIA and new regulations on our patent portfolio. These changes could increase the costs and uncertainties surrounding the prosecution of our patent applications and the enforcement or defense of our patent rights.

Additional uncertainty may result from legal precedent handed down by the United States Federal Circuit Court and Supreme Court as they determine legal issues concerning the scope and construction of patent claims and inconsistent interpretation of patent laws by the lower courts. Accordingly, we cannot ensure that any of our pending patent applications will result in issued patents, or even if issued, predict the breadth of the claims upheld in our and other companies' patents. Given that the degree of future protection for our proprietary rights is uncertain, we cannot ensure that: (i) we were the first to invent the inventions covered by each of our pending applications, (ii) we were the first to file patent applications for these inventions, or (iii) the proprietary technologies we develop will be patentable. In addition, unauthorized parties may attempt to copy or otherwise obtain and use our products or technology. Monitoring unauthorized use of our intellectual property is difficult, and we cannot be certain that the steps we have taken will prevent unauthorized use of our technology, particularly in certain foreign countries where the local laws may not protect our proprietary rights as fully as in the United States. Moreover, third parties could practice our inventions in territories where we do not have patent protection. Such third parties may then try to import products made using our inventions into the United States or other countries. If competitors are able to use our technology, our ability to compete effectively could be harmed. In addition, others may independently develop and obtain patents for technologies that are similar to or superior to our technologies. If that happens, we may need to license these technologies, and we may not be able to obtain licenses on reasonable terms, if at all, which could cause harm to our business.

Third parties may claim that we are infringing their intellectual property rights or other proprietary rights, which may subject us to costly and time consuming litigation and prevent us from developing or commercializing our products.

Our commercial success also depends in part on our ability to operate without infringing patents and proprietary rights of third parties, and without breaching any licenses or other agreements that we have entered into with regard to our

technologies, services, products and business. We cannot ensure that patents have not been issued to third parties that could block our ability to obtain patents or to operate as we would like. There may be patents in some countries that, if valid, may block our ability to make, use or sell our products in those countries, or import our products into those countries, if we are unsuccessful in circumventing or acquiring rights to these patents. There also may be claims in patent applications filed in some countries that, if granted and valid, may also block our ability to commercialize products or processes in these countries if we are unable to circumvent or license them.

The industries in which we operate and the biotechnology industry, in particular, are characterized by frequent and extensive litigation regarding patents and other intellectual property rights. Many biotechnology companies have employed intellectual property litigation as a way to gain a competitive advantage. Our involvement in litigation or other intellectual property proceedings inside and outside of the United States, to defend our intellectual property rights or as a result of alleged infringement of the rights of others, may divert our management's time from focusing on business operations and could cause us to spend significant amounts of money. Any potential intellectual property litigation also could force us to do one or more of the following:

- stop selling or using our products or technologies that use the subject intellectual property;
- pay monetary damages or substantial royalties;
- grant cross-licenses to third parties relating to our patents or proprietary rights;
- obtain from the third party asserting its intellectual property rights a license to sell or use the relevant technology, which license may not be available on reasonable terms, or at all; or
- redesign those products or processes that use any allegedly infringing technology, or relocate the operations relating to the allegedly infringing technology to another jurisdiction, which may result in significant cost or delay to us, could be technically infeasible or could prevent us from selling some of our products in the United States or other jurisdictions.

We are aware of some patents and patent applications relating to aspects of our technologies filed by, and issued to, third parties. We cannot assure you that if this third party intellectual property is asserted against us that we would ultimately prevail.

We may be involved in lawsuits to protect or enforce our intellectual property rights, which could be expensive, time-consuming and unsuccessful.

Competitors may infringe our intellectual property rights or those of our licensors. To prevent infringement or unauthorized use, we have in the past filed, and may in the future be required to file, infringement claims, which can be expensive and time-consuming. In addition, in an infringement proceeding, a court may decide that the intellectual property that we own or in-license is not valid, is unenforceable and/or is not infringed. In addition, in legal proceedings against a third party to enforce a patent directed at one of our technologies, services or products, the defendant could counterclaim that our patent is invalid and/or unenforceable in whole or in part. In patent litigation in the United States, defendant counterclaims alleging invalidity and/or unenforceability are commonplace. Grounds for a patent validity challenge include an alleged failure to meet any of several statutory requirements, including lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could include an allegation that someone connected with prosecution of the patent withheld relevant information from the United States Patent and Trademark Office ("USPTO") or made a misleading statement during prosecution. Third parties may also raise similar claims before the USPTO, even outside the context of litigation. The outcome following legal assertions of invalidity and unenforceability is unpredictable, and prior art could render our patents or those of our licensors invalid. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, we would lose at least part, and perhaps all, of the patent protection on such product. Such a loss of patent protection would have a material adverse impact on our business.

Even if resolved in our favor, litigation or other legal proceedings relating to our intellectual property rights may cause us to incur significant expenses, and could distract our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our expenses and reduce the resources available for operations and research and development activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could compromise our ability to compete in the marketplace. Furthermore, because of the substantial amount of discovery

required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation.

We may not be able to enforce our intellectual property rights throughout the world.

The laws of some foreign countries where we do business do not protect intellectual property rights to the same extent as the laws of the United States. Many companies have encountered significant problems in protecting and defending intellectual property rights in certain foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property, particularly those relating to biotechnology and/or bioindustrial technologies. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate. This could make it difficult for us to stop the infringement of our patents or misappropriation of our other intellectual property rights. Additionally, proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business.

If our biocatalysts, or the genes that code for our biocatalysts, are stolen, misappropriated or reverse engineered, others could use these biocatalysts or genes to produce competing products.

Third parties, including our contract manufacturers, customers and those involved in shipping our biocatalysts, often have custody or control of our biocatalysts. If our biocatalysts, or the genes that code for our biocatalysts, were stolen, misappropriated or reverse engineered, they could be used by other parties who may be able to reproduce these biocatalysts for their own commercial gain. If this were to occur, it may be difficult for us to challenge this type of use, especially in countries with limited intellectual property protection or in countries in which we do not have patents covering the misappropriated biocatalysts.

Risks Related to Owning our Common Stock

We are subject to anti-takeover provisions in our certificate of incorporation and bylaws and under Delaware law that could delay or prevent an acquisition of our company, even if the acquisition would be beneficial to our stockholders.

Provisions in our amended and restated certificate of incorporation and our bylaws may delay or prevent an acquisition of us. Among other things, our amended and restated certificate of incorporation and bylaws provide for a board of directors which is divided into three classes, with staggered three-year terms and provide that all stockholder action must be effected at a duly called meeting of the stockholders and not by a consent in writing, and further provide that only our board of directors, the chairman of the board of directors, our chief executive officer or president may call a special meeting of the stockholders. In addition, our amended and restated certificate of incorporation allows our board of directors, without further action by our stockholders, to issue up to 5,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These provisions may also frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors, who are responsible for appointing the members of our management team. Furthermore, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law which prohibits, with some exceptions, stockholders owning in excess of 15% of our outstanding voting stock from merging or combining with us. Finally, our charter documents establish advanced notice requirements for nominations for election to our board of directors and for proposing matters that can be acted upon at stockholder meetings. Although we believe these provisions together provide for an opportunity to receive higher bids by requiring potential acquirers to negotiate with our board of directors, they would apply even if an offer to acquire our company may be considered beneficial by some stockholders.

Our quarterly or annual operating results may fluctuate in the future. As a result, we may fail to meet or exceed the expectations of research analysts or investors, which could cause our stock price to decline.

Our financial condition and operating results have varied significantly in the past and may continue to fluctuate from quarter to quarter and year to year in the future due to a variety of factors, many of which are beyond our control. Factors relating to our business that may contribute to these fluctuations include the following factors, as well as other factors described elsewhere in this report:

- our ability to achieve or maintain profitability;
- our relationships with, and dependence on, collaborators in our principal markets;

- our dependence on a limited number of customers, including Pfizer;
- our product supply agreements with customers have finite duration, may not be extended or renewed and generally do not require the customer to purchase any particular quantity or quantities of our products;
- with respect to customers purchasing our products for the manufacture of active pharmaceutical products (API) for which they have exclusivity due to patent protection, the termination or expiration of such patent protection and any resulting generic competition may materially and adversely affect our revenues, financial condition or results of operations;
- our dependence on a limited number of products in our performance enzymes business;
- our reliance on a limited number of contract manufacturers for large scale production of substantially all of our enzyme products;
- our ability to develop and successfully commercialize new products for the markets we serve;
- our ability to obtain additional development partners for our novel biotherapeutic programs;
- potential of Nestlé Health Science or Takeda terminating any development program under their license agreements with us;
- potential of GSK, Merck, Novartis or any other performance enzyme customer terminating their agreements with us;
- our ability to deploy our technology platform in the fine chemicals market;
- the success of our customers' products in the market and the ability of such customers to obtain regulatory approvals for products and processes;
- our or our customers' ability to obtain regulatory approval for the sale and manufacturing of food products using our enzymes;
- our ability to deploy our technology platform in life science tools markets;
- our ability to successfully achieve domestic and foreign regulatory approval for product candidates;
- our ability to successfully design and execute clinical testing at a reasonable cost and on an acceptable time-frame;
- our dependence on product candidates which could unexpectedly fail at any stage of preclinical or clinical development;
- our dependence on product candidates which may lack the ability to work as intended or cause undesirable side effects;
- our dependency on third parties to conduct clinical trials, research, and preclinical studies;
- our ability to successfully prosecute and protect our intellectual property;
- our ability to compete if we do not adequately protect our proprietary technologies or if we lose some of our intellectual property rights;
- our ability to avoid infringing the intellectual property rights of third parties;
- our involvement in lawsuits to protect or enforce our patents or other intellectual property rights;
- our ability to enforce our intellectual property rights throughout the world;
- our dependence on, and the need to attract and retain, key management and other personnel;
- our ability to prevent the theft or misappropriation of our biocatalysts, the genes that code for our biocatalysts, know-how or technologies;
- our ability to protect our trade secrets and other proprietary information from disclosure by employees and others;
- our ability to obtain substantial additional capital that may be necessary to expand our business;
- our ability to comply with the terms of our credit facility;
- our ability to timely pay debt service obligations;
- our customers' ability to pay amounts owed to us in a timely manner;

- our ability to avoid charges to earnings as a result of any impairment of goodwill, intangible assets or other long-lived assets;
- changes in financial accounting standards or practices may cause adverse, unexpected financial reporting fluctuations and affect our reported results of operations;
- our ability to maintain effective internal control over financial reporting;
- our dependency on information technology systems, infrastructure and data;
- our ability to control and to improve product gross margins;
- our ability to protect against risks associated with the international aspects of our business;
- the cost of compliance with European Union chemical regulations;
- potential advantages that our competitors and potential competitors may have in securing funding or developing products;
- our ability to accurately report our financial results in a timely manner;
- results of regulatory tax examinations;
- business interruptions due to natural disasters, disease outbreaks or other events beyond our control;
- public concerns about the ethical, legal and social ramifications of genetically engineered products and processes;
- our ability to integrate our current business with any businesses that we may acquire in the future;
- our ability to properly handle and dispose of hazardous materials in our business;
- potential product liability claims;
- changes to tax law and related regulations could materially affect our tax obligations and effective tax rate; and
- our ability to use our net operating loss carryforwards to offset future taxable income.

Due to the various factors mentioned above, and others, the results of any prior quarterly or annual periods should not be relied upon as indications of our future operating performance.

We do not intend to pay cash dividends for the foreseeable future.

We currently intend to retain our future earnings, if any, to finance the further development and expansion of our business and do not intend to pay cash dividends in the foreseeable future. Any future determination to pay dividends will be at the discretion of our board of directors and will depend on our financial condition, results of operations, capital requirements, restrictions contained in future agreements and financing instruments, business prospects and such other factors as our board of directors deems relevant.

General Risk Factors

If securities or industry analysts do not publish research or reports about our business, or publish negative reports about our business, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that securities or industry analysts publish about us or our business. We do not have any control over these analysts. If one or more of the analysts who cover us downgrade our stock or change their opinion of our stock in a negative manner, our stock price would likely decline. If one or more of these analysts cease coverage of our company or fail to regularly publish reports on us, we could lose visibility in the financial markets, which could cause our stock price or trading volume to decline.

We face risks associated with our international business.

While we have a limited number of employees located outside of the United States, we are and will continue to be dependent upon contract manufacturers located outside of the United States. In addition, we have customers and partners located outside of the United States. Conducting business internationally exposes us to a variety of risks, including:

- changes in or interpretations of foreign regulations that may adversely affect our ability to sell our products, repatriate profits to the United States or operate our foreign-located facilities;
- the imposition of tariffs;
- the imposition of limitations on, or increase of, withholding and other taxes on remittances and other payments by foreign subsidiaries or joint ventures;
- the imposition of limitations on genetically-engineered products or processes and the production or sale of those products or processes in foreign countries;
- currency exchange rate fluctuations;
- uncertainties relating to foreign laws, regulations and legal proceedings including tax, import/export, anti-corruption and exchange control laws;
- the availability of government subsidies or other incentives that benefit competitors in their local markets that are not available to us;
- increased demands on our limited resources created by our operations may constrain the capabilities of our administrative and operational resources and restrict our ability to attract, train, manage and retain qualified management, technicians, scientists and other personnel;
- economic or political instability in foreign countries;
- difficulties associated with staffing and managing foreign operations; and
- the need to comply with a variety of United States and foreign laws applicable to the conduct of international business, including import and export control laws and anti-corruption laws.

Business interruptions resulting from disasters or other disturbances could delay us in the process of developing our products and could disrupt our sales. Our business continuity and disaster recovery plans may not adequately protect us from a serious disaster or other disturbance.

Our headquarters and other facilities are located in the San Francisco Bay Area, which in the past has experienced both severe earthquakes and wildfires. Earthquakes, wildfires or other natural disasters could severely disrupt our operations, and have a material adverse effect on our business, results of operations, financial condition and prospects. We are also vulnerable to other types of disasters and other events that could disrupt our operations, such as riot, civil disturbances, war, terrorist acts, infections in our laboratory or production facilities or those of our customers or contract manufacturers and other events beyond our control. If a natural disaster or other event occurred that prevented us from using all or a significant portion of our headquarters, that damaged critical infrastructure, such as our enterprise financial systems or manufacturing resource planning and enterprise quality systems, or that otherwise disrupted operations, it may be difficult or, in certain cases, impossible, for us to continue our business for a substantial period of time. The disaster recovery and business continuity plans we have in place currently are limited and are unlikely to prove adequate in the event of a serious disaster or similar event. We may incur substantial expenses as a result of the limited nature of our disaster recovery and business continuity plans. We do not carry insurance for earthquakes and we may not carry sufficient business interruption insurance to compensate us for losses that may occur. Any losses or damages we incur could have a material adverse effect on our cash flows and success as an overall business.

Confidentiality agreements with employees and others may not adequately prevent disclosures of trade secrets and other proprietary information.

We rely in part on trade secret and confidentiality protection to protect our confidential and proprietary information and processes. However, trade secrets and confidential information are difficult to protect. We have taken measures to protect our trade secrets and confidential and proprietary information, but these measures may not be effective. We require employees and consultants to execute confidentiality agreements upon the commencement of an employment or consulting arrangement with us. These agreements generally require that all confidential information developed by the individual or made known to the individual by us during the course of the individual's relationship with us be kept confidential and not disclosed to third parties. These agreements also generally provide that inventions conceived by the individual in the course of rendering services to us shall be our exclusive property. Nevertheless, our confidential and proprietary information may be disclosed, third parties could reverse engineer our biocatalysts and others may independently develop substantially equivalent confidential and proprietary information and techniques or otherwise gain access to our trade secrets. Costly and time-consuming litigation could be necessary to enforce and determine the scope of our confidential and proprietary rights, and failure to obtain or maintain trade secret protection could adversely affect our competitive business position.

We are dependent on information technology systems, infrastructure and data, and any failure of these systems could harm our business. Security breaches, loss of data, and other disruptions could compromise sensitive information related to our business or prevent us from accessing critical information and expose us to liability, which could adversely affect our business, results of operations and financial condition.

Information technology helps us operate efficiently, interface with customers, maintain financial accuracy and efficiency, and accurately produce our financial statements. If we do not allocate and effectively manage the resources necessary to build and sustain the proper technology infrastructure, we could be subject to transaction errors, processing inefficiencies, the loss of customers, business disruptions, or the loss of or damage to intellectual property through security breach. If our data management systems do not effectively collect, store, process, and report relevant data for the operation of our business, whether due to equipment malfunction or constraints, software deficiencies, or human error, our ability to effectively plan, forecast, and execute our business plan and comply with applicable laws and regulations will be impaired, perhaps materially. Any such impairment could materially and adversely affect our financial condition, results of operations, cash flows, and the timeliness with which we report our internal and external operating results.

Our business may require us to use and store personal information of our customers, employees, and business partners. This may include names, addresses, phone numbers, email addresses, contact preferences, tax identification numbers, and payment account information. We require usernames and passwords in order to access our information technology systems. We also use encryption and authentication technologies to secure the transmission and storage of data. However, these security measures may be compromised as a result of security breaches by unauthorized persons, employee error, malfeasance, faulty password management, or other irregularity, and result in persons obtaining unauthorized access to our data or accounts. Third parties may attempt to fraudulently induce employees or customers into disclosing usernames, passwords, or other sensitive information, which may in turn be used to access our information technology systems. For example, our employees have received “phishing” emails and phone calls attempting to induce them to divulge passwords and other sensitive information.

In addition, unauthorized persons may attempt to hack into our products or systems to obtain personal data relating to employees and other individuals, our confidential or proprietary information or confidential information we hold on behalf of third parties. We also rely on external vendors to supply and/or support certain aspects of our information technology systems. The systems of these external vendors may contain defects in design or manufacture or other problems that could unexpectedly compromise information security of our own systems, and we are dependent on these third parties to deploy appropriate security programs to protect their systems. If we or our third-party vendors were to experience a significant cybersecurity breach of our or their information systems or data, the costs associated with the investigation, remediation and potential notification of the breach to counter-parties and data subjects could be material. Our remediation efforts may not be successful. Further, if such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our development programs and our business operations, whether due to a loss, corruption or unauthorized disclosure of our trade secrets, personal information or other proprietary or sensitive information or other similar disruptions. Attacks upon information technology systems are also increasing in their frequency, levels of persistence, sophistication and intensity, and are being conducted by sophisticated and organized groups and individuals with a wide range of motives and expertise. As a result of the COVID-19 pandemic, we may also face increased cybersecurity risks due to our reliance on internet technology and the number of our employees who are working remotely, which may create additional opportunities for cybercriminals to exploit vulnerabilities. We have programs in place to detect, contain, and respond to data security incidents, and we make ongoing improvements to our information-sharing products in order to minimize vulnerabilities, in accordance with industry and regulatory standards. However, because the techniques used to obtain unauthorized access to or sabotage systems change frequently and may be difficult to detect, we may not be able to anticipate and prevent these intrusions or mitigate them when and if they occur.

If a security breach or other incident were to result in the unauthorized access to or unauthorized use, disclosure, release or other processing of personal information, it may be necessary to notify individuals, governmental authorities, supervisory bodies, the media and other parties pursuant to privacy and security laws. Any security compromise affecting us, our service providers, vendors, strategic partners, other contractors, consultants, or our industry, whether real or perceived, could harm our reputation, erode confidence in the effectiveness of our security measures and lead to regulatory scrutiny. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or systems, or inappropriate disclosure of confidential or proprietary or personal information, we could incur liability, including litigation exposure, penalties and fines, we could become the subject of regulatory action or investigation, our competitive position could be harmed and the further development of our products could be delayed. If such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our business. Furthermore, federal, state and international laws and regulations can expose us to enforcement actions and investigations by regulatory authorities, and potentially result in regulatory penalties, fines and significant legal liability, if our information technology security efforts

fail. We may also be exposed to a risk of loss or litigation and potential liability, which could materially and adversely affect our business, results of operations and financial condition.

Actual or perceived failures to comply with applicable data protection, privacy and security laws, regulations, standards and other requirements could adversely affect our business, results of operations, and financial condition.

The global data protection landscape is rapidly evolving, and we are or may become subject to state, federal and foreign laws, regulations, decisions, and directives governing the privacy, security, collection, storage, transmission, use, processing, retention and disclosure of personal information. Any failure or perceived failure by us to comply with applicable laws or regulations, our internal policies and procedures or our contracts governing our processing of personal information could result in negative publicity, government investigations and enforcement actions, claims by third parties and damage to our reputation, any of which could have a material adverse effect on our operations, financial performance and business.

In the United States, HIPAA imposes, among other things, certain standards relating to the privacy, security, transmission and breach reporting of individually identifiable health information. Certain states have also adopted comparable privacy and security laws and regulations, some of which may be more stringent than HIPAA. Such laws and regulations will be subject to interpretation by various courts and other governmental authorities, thus creating potentially complex compliance issues for us and our future customers and strategic partners. For example, the CCPA went into effect on January 1, 2020 , and introduces new compliance burdens on organizations doing business in California that collect personal information about California residents. It creates individual privacy rights for California consumers and increases the privacy and security obligations of entities handling certain personal information. The CCPA also provides for civil penalties for violations, as well as a private right of action for data breaches that is expected to increase data breach litigation. Further, the CPRA recently passed in California. The CPRA will impose additional data protection obligations on covered businesses, including additional consumer rights processes, limitations on data uses, new audit requirements for higher risk data, and opt outs for certain uses of sensitive data. It will also create a new California data protection agency authorized to issue substantive regulations and could result in increased privacy and information security enforcement. The majority of the provisions will go into effect on January 1, 2023, and additional compliance investment and potential business process changes may be required. Similar laws have passed in Virginia and Colorado, and have been proposed in other states and at the federal level, reflecting a trend toward more stringent privacy legislation in the United States. These developments increase our compliance burden and our risk, including risks of regulatory fines, litigation and associated reputational harm. Any liability from failure to comply with the requirements of these laws could adversely affect our financial condition.

Furthermore, the Federal Trade Commission ("FTC") and many state Attorneys General continue to enforce federal and state consumer protection laws against companies for online collection, use, dissemination and security practices that appear to be unfair or deceptive. For example, according to the FTC, failing to take appropriate steps to keep consumers' personal information secure can constitute unfair acts or practices in or affecting commerce in violation of Section 5(a) of the Federal Trade Commission Act. The FTC expects a company's data security measures to be reasonable and appropriate in light of the sensitivity and volume of consumer information it holds, the size and complexity of its business, and the cost of available tools to improve security and reduce vulnerabilities.

In Europe, the GDPR went into effect in May 2018 and imposes strict requirements for processing the personal data of individuals within the EEA. The GDPR imposes stringent requirements for controllers and processors of personal data and increases our obligations, for example, by imposing higher standards when obtaining consent from individuals to process their personal data, requiring more robust disclosures to individuals, strengthening individual data rights, shortening timelines for data breach notifications, limiting retention periods and secondary use of information, increasing requirements pertaining to health data as well as pseudonymized (i.e., key-coded) data, and imposing additional obligations when we contract with third-party processors in connection with the processing of personal data. The GDPR provides that EEA member states may make their own additional laws and regulations limiting the processing of genetic, biometric, or health data, which could limit our ability to use and share personal data or could cause our costs to increase and harm our business and financial condition. Failure to comply with the requirements of the GDPR can result in fines of up to the greater of €20 million and 4% of the total worldwide annual turnover of the preceding financial year and other administrative penalties. If we are required to comply with the new data protection rules imposed by GDPR, such compliance may be onerous and adversely affect our business, financial condition, and results of operations. Among other requirements, the GDPR regulates transfers of personal data subject to the GDPR to third countries that have not been found to provide adequate protection to such personal data, including the United States, and the efficacy and longevity of current transfer mechanisms between the EU and the United States remains uncertain. For example, in July 2020, the Court of Justice of the EU ("CJEU") limited how organizations could lawfully transfer personal data from the EU/EEA to the United States by

invalidating the Privacy Shield for purposes of international transfers and imposing further restrictions on the use of standard contractual clauses ("SCCs"). The European Commission issued revised SCCs on June 4, 2021 to account for the decision of the CJEU and recommendations made by the European Data Protection Board. The revised SCCs must be used for relevant new data transfers from September 27, 2021; existing standard contractual clauses arrangements must be migrated to the revised clauses by December 27, 2022. The new SCCs apply only to the transfer of personal data outside of the EEA and not the United Kingdom; the United Kingdom's Information Commissioner's Office launched a public consultation on its draft revised data transfers mechanisms in August 2021. There is some uncertainty around whether the revised clauses can be used for all types of data transfers, particularly whether they can be relied on for data transfers to non-EEA entities subject to the GDPR. As supervisory authorities issue further guidance on personal data export mechanisms, including circumstances where the SCCs cannot be used, and/or start taking enforcement action, we could suffer additional costs, complaints and/or regulatory investigations or fines, and/or if we are otherwise unable to transfer personal data between and among countries and regions in which we operate, it could affect the manner in which we provide our services, the geographical location or segregation of our relevant systems and operations, and could adversely affect our financial results.

Further, from January 1, 2021, companies have had to comply with the GDPR and also the United Kingdom GDPR ("UK GDPR"), which, together with the amended UK Data Protection Act 2018, retains the GDPR in UK national law. The UK GDPR mirrors the fines under the GDPR, i.e., fines up to the greater of €20 million (or up to £17.5 million for UK) or 4% of global turnover. The relationship between the United Kingdom and the European Union in relation to certain aspects of data protection law remains unclear, and it is unclear how United Kingdom data protection laws and regulations will develop in the medium to longer term. The European Commission has adopted an adequacy decision in favor of the United Kingdom, enabling data transfers from EU member states to the United Kingdom without additional safeguards. However, the UK adequacy decision will automatically expire in June 2025 unless the European Commission re-assesses and renews or extends that decision.

Although we work to comply with applicable laws, regulations and standards, our contractual obligations and other legal obligations, these requirements are evolving and may be modified, interpreted and applied in an inconsistent manner from one jurisdiction to another, and may conflict with one another or other legal obligations with which we must comply. Various federal, state and foreign legislative or regulatory bodies may enact new or additional laws and regulations concerning privacy, data-retention and data-protection issues, including laws or regulations mandating disclosure to domestic or international law enforcement bodies, which could adversely impact our business or our reputation with customers. For example, some countries have adopted laws mandating that certain personal information regarding customers in their country be maintained solely in their country. Having to maintain local data centers and redesign product, service and business operations to limit Personal Information processing to within individual countries could increase our operating costs significantly. Any failure, or perceived failure, by us to comply with federal, state or international privacy, data-retention or data-protection-related laws, regulations, orders or industry self-regulatory principles could result in proceedings or actions against us by governmental entities or others, a loss of customer confidence, damage to our brand and reputation and a loss of customers, any of which could have an adverse effect on our business.

Evolving expectations around corporate responsibility practices, specifically related to environmental, social and governance ("ESG") matters, may expose us to reputational and other risks.

Investors, stockholders, customers, suppliers and other third parties are increasingly focusing on ESG and corporate social responsibility endeavors and reporting. Companies that do not adapt to or comply with the evolving investor or stakeholder expectations and standards, or which are perceived to have not responded appropriately, may suffer from reputational damage and result in the business, financial condition and/or stock price of a company being materially and adversely affected. Further, this increased focus on ESG issues may result in new regulations and/or third-party requirements that could adversely impact our business, or certain shareholders reducing or eliminating their holdings of our stock. Additionally, an allegation or perception that we have not taken sufficient action in these areas could negatively harm our reputation.

ITEM 1B. UNRESOLVED STAFF COMMENTS

Not applicable.

ITEM 2. PROPERTIES

Facilities

Our headquarters are located in Redwood City, California, where we lease approximately 77,300 square feet of office and laboratory space.

Our lease ("RWC Lease") with Metropolitan Life Insurance Company ("MetLife") includes approximately 28,200 square feet of space located at 200 and 220 Penobscot Drive, Redwood City, California (the "200/220 Penobscot Space"), approximately 37,900 square feet of space located at 400 Penobscot Drive, Redwood City, California (the "400 Penobscot Space") (the 200/220 Penobscot Space and the 400 Penobscot Space are collectively referred to as the "Penobscot Space"), and approximately 11,200 square feet of space located at 501 Chesapeake Drive, Redwood City, California (the "Chesapeake Space").

We entered into the initial lease with MetLife for our facilities in Redwood City in 2004 and the RWC lease has been amended multiple times since then to adjust the leased space and terms of the RWC Lease. In February 2019, we entered into an Eighth Amendment to the RWC Lease (the "Eighth Amendment") with MetLife with respect to the Penobscot Space and the 501 Chesapeake Space to extend the term of the RWC Lease for additional periods. Pursuant to the Eighth Amendment, the term of the lease of the Penobscot Space has been extended through May 2027. The lease term for the 501 Chesapeake Space has been extended to May 2029. We have one (1) option to extend the term of the lease for the Penobscot Space for five (5) years, and one (1) separate option to extend the term of the lease for the 501 Chesapeake Space for five (5) years.

In January 2021, we entered into a lease agreement with ARE-San Francisco No. 63, LLC ("ARE") to lease a portion of a facility comprising approximately 36,593 rentable square feet at 825 Industrial Road, San Carlos, California to serve as additional office and research and development laboratory space (the "San Carlos Space"). In December 2021, we commenced occupancy of the San Carlos Space. The lease term for the San Carlos Space is through the end of November 2031. We have one (1) option to extend the term of the lease for the San Carlos Space for five (5) years.

In May 2021, we entered into a short-term office lease with The Inside Source, Inc., to sublease approximately 3,313 square feet of office space in a building located at 985 Industrial Blvd.. San Carlos, California. This lease will expire in April 2022.

We believe that the facilities that we currently lease in Redwood City and San Carlos, California are adequate for our needs for the immediate future and that, should it be needed, additional space can be leased to accommodate any future growth.

ITEM 3. LEGAL PROCEEDINGS

We are currently not a party to any material pending litigation or other material legal proceedings.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information

Our common stock is quoted on the Nasdaq Global Select Market ("Nasdaq"), under the symbol "CDXS."

As of February 24, 2022, there were approximately 129 stockholders of record. A substantially greater number of stockholders may be "street name" or beneficial holders, whose shares are held of record by banks, brokers and other financial institutions.

Dividend Policy

We have never declared or paid cash dividends on our common stock, and we currently do not plan to declare dividends on shares of our common stock in the foreseeable future. We expect to retain our future earnings, if any, for use in the operation and expansion of our business. In addition, unless waived, the terms of our Credit Facility prohibit us from paying any cash dividends or making other distributions. The payment of cash dividends in the future, if any, will be at the discretion of our board of directors and will depend upon such factors as earnings levels, capital requirements, our overall financial condition and any other factors deemed relevant by our board of directors.

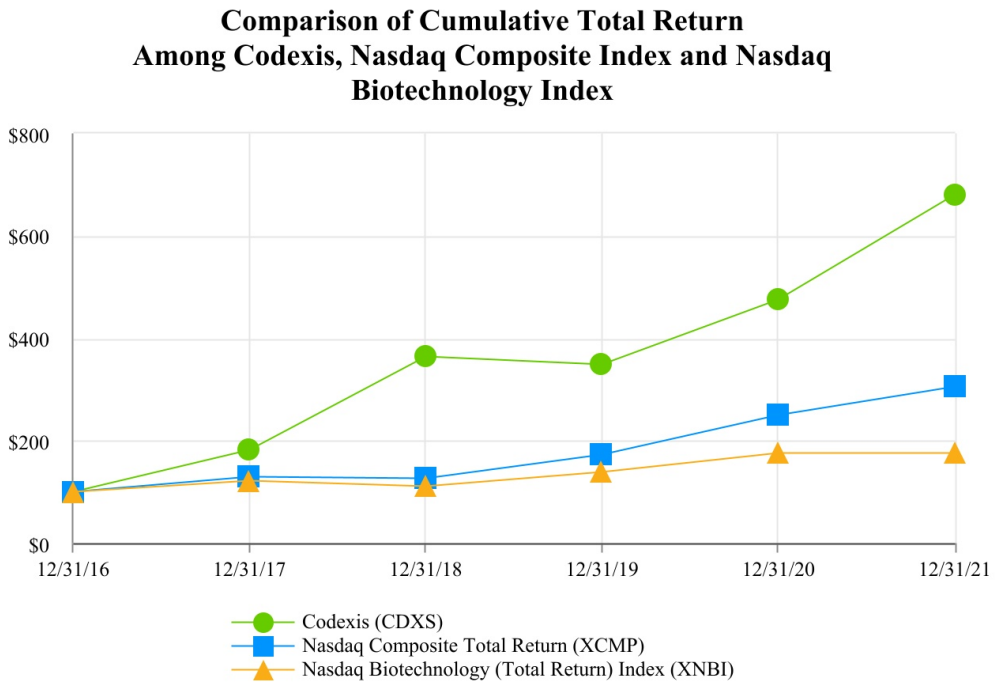
Securities Authorized for Issuance under Equity Compensation Plans

The information required by this item concerning securities authorized for issuance under equity compensation plans is incorporated by reference from the information that will be set forth in the Definitive Proxy Statement to be filed with the Securities and Exchange Commission in connection with the Annual Meeting of Stockholders to be held in 2022 (the "2022 Proxy Statement") under the heading "Executive Compensation—Equity Compensation Plan Information."

Stock Price Performance Graph

The following tabular information and graph compare our total common stock return with the total return for (i) the Nasdaq Composite Index and (ii) the Nasdaq Biotechnology Index for the period December 31, 2016 through December 31, 2021. The figures represented below assume an investment of $100 in our common stock at the closing price on December 31, 2016 and in the Nasdaq Composite Index and the Nasdaq Biotechnology Index on December 31, 2016 and the reinvestment of dividends into shares of common stock. The comparisons in the table and graph are required by the SEC and are not intended to forecast or be indicative of possible future performance of our common stock. The tabular information and graph shall not be deemed "soliciting material" or to be "filed" for purposes of Section 18 of the Exchange Act or otherwise subject to the liabilities under that Section, and shall not be deemed to be incorporated by reference into any of our filings under the Securities Act or the Exchange Act.

		December 31,					
$100 investment in stock or index	**Ticker**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Codexis, Inc.	CDXS	$ 100.00	$ 181.52	$ 363.04	$ 347.61	$ 474.57	$ 679.78
Nasdaq Composite Total Return	XCMP	$ 100.00	$ 129.63	$ 125.95	$ 172.17	$ 249.51	$ 304.84
Nasdaq Biotechnology (Total Return) Index	XNBI	$ 100.00	$ 121.64	$ 110.86	$ 138.69	$ 175.33	$ 175.37



Unregistered Sales of Equity Securities and Use of Proceeds

Unregistered Sales of Equity Securities

During the year ended December 31, 2021, we did not issue or sell any unregistered securities not previously disclosed in a Quarterly Report on Form 10-Q or in a Current Report on Form 8-K.

Issuer Purchases of Equity Securities

None.

ITEM 6. [RESERVED]

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion and analysis should be read in conjunction with our audited Consolidated Financial Statements and the related Notes that appear elsewhere in this Annual Report on Form 10-K. This Annual Report on Form 10-K contains "forward-looking statements" within the meaning of Section 21E of the Exchange Act. These statements are often identified by the use of words such as "may," "will," "expect," "believe," "anticipate," "intend," "could," "should," "estimate," or "continue," and similar expressions or variations. Such forward-looking statements are subject to risks, uncertainties and other factors that could cause actual results and the timing of certain events to differ materially from future results expressed or implied by such forward-looking statements. Factors that could cause or contribute to such differences include, but are not limited to, those discussed in the section titled "Risk Factors," set forth in Part I, Item 1A of this Annual Report on Form 10-K and elsewhere in this report. The forward-looking statements in this Annual Report on Form 10-K represent our views as of the date of this Annual Report on Form 10-K. We anticipate that subsequent events and developments will cause our views to change. However, while we may elect to update these forward-looking statements at some point in the future, we have no current intention of doing so except to the extent required by applicable law. You should, therefore, not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this Annual Report on Form 10-K.

Business Overview

We discover, develop and sell enzymes and other proteins that deliver value to our clients in a growing set of industries. We view proteins as a vast, largely untapped source of value-creating products, and we are using our proven technologies, which we have been continuously improving since our inception in 2002, to commercialize an increasing number of novel enzymes, both as proprietary Codexis products and in partnership with our customers.

We are a pioneer in harnessing computational technologies to drive biology advancements. Since 2002, we have made substantial investments in the development of our CodeEvolver® protein engineering technology platform, the primary source of our competitive advantage. Our technology platform is powered by proprietary, artificial intelligence-based, computational algorithms that rapidly mine the structural and performance attributes of our large and continuously growing library of protein variants. These computational outputs enable increasingly reliable predictions for next generation protein variants to be engineered, enabling time- and cost-efficient delivery of the targeted performance enhancements. In addition to its computational prowess, our CodeEvolver® protein engineering technology platform integrates additional modular competencies, including robotic high-throughput screening and genomic sequencing, organic chemistry and bioprocess development which are all coordinated to rapidly innovate novel, fit-for-purpose products.

The core historical application of the technology has been in developing commercially viable biocatalytic manufacturing processes for more sustainable production of complex chemicals. It begins by conceptually designing the most cost-effective and practical process for a targeted product. We then develop optimized biocatalysts to enable the designed process, using our CodeEvolver® platform. Engineered biocatalyst candidates, numbering many thousands for each project, are then rapidly screened and validated using high throughput methods under process-relevant operating conditions. This approach results in an optimized biocatalyst that enables cost-efficient processes that are relatively simple to run in conventional manufacturing equipment. This also allows for efficient technical transfer of our processes to our manufacturing partners.

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the manufacture of small molecule pharmaceuticals, which remains a primary business focus. Our customers, which include many large, global pharmaceutical companies, use our technology, products and services in their process development and in manufacturing. Additionally, we have licensed our proprietary CodeEvolver® protein engineering technology platform to global pharmaceutical companies enabling them to use this technology, in house, to engineer enzymes for their own businesses. In May 2019, we entered into a Platform Technology Transfer and License Agreement (the "Novartis CodeEvolver® Agreement") with Novartis. The Novartis CodeEvolver® Agreement (Codexis' third such agreement with large pharma companies) allows Novartis to use our proprietary CodeEvolver® protein engineering platform technology in the field of human healthcare.

As evidence of our strategy to extend our technology beyond pharmaceutical manufacturing, we have also used the technology to develop biocatalysts and enzyme products for use in a broader set of industrial markets, including several large verticals, such as food, feed, consumer care and fine chemicals. In addition, we are using our technology to develop enzymes for various life science related applications, such as next generation sequencing ("NGS") and polymerase chain reaction ("PCR/qPCR") for in vitro molecular diagnostic and genomic research applications. In December 2019, we entered into a license agreement to provide Roche Sequencing Solutions, Inc. with our first enzyme for this target market: the Company's EvoT4™ DNA ligase. In June 2020, we also entered into a Master Collaboration and Research Agreement with MAI (the "MAI Agreement") pursuant to which we are leveraging our CodeEvolver® platform technology to improve the DNA polymerase enzymes that are critical for enzymatic DNA synthesis.

Approximately six years ago, we began using the CodeEvolver® protein engineering technology platform to develop early stage, novel biotherapeutic product candidates, both in partnership with customers and for our own proprietary Codexis drug candidates. Our first program was for the potential treatment of phenylketonuria ("PKU") in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we entered into a Global Development, Option and License Agreement (the "Nestlé License Agreement") with Societé des Produits Nestlé S.A., formerly known as Nestec Ltd. ("Nestlé Health Science") to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive license to develop and commercialize CDX-6114. Also in October 2017, we entered into the Nestlé SCA pursuant to which we and Nestlé Health Science are collaborating to leverage the CodeEvolver® platform technology to develop other novel enzymes for Nestlé Health Science's established Consumer Care and Medical Nutrition business areas. In March 2020, we entered into a Strategic Collaboration and License Agreement ("Takeda Agreement") with Shire Human Genetic Therapies, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited ("Takeda"), for the research and development of novel gene therapies for certain disease indications, including the treatment of lysosomal storage disorders and a blood factor deficiency.

See Note 5, "Collaborative Arrangements" in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K for further information.

Recent Development - Pfizer (PAXLOVID™)

In the first and second quarters of 2021, we began to receive purchase orders from Pfizer, Inc. ("Pfizer") for large quantities of our proprietary enzyme product, CDX-616, for use by Pfizer in the manufacture of a critical intermediate for its proprietary active pharmaceutical ingredient, nirmatrelvir. Pfizer markets, sells and distributes nirmatrelvir, in combination with the active pharmaceutical ingredient ritonavir, as its PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets) product, which received emergency use authorization by the U.S. Food and Drug Administration ("FDA") in late 2021 for the treatment of COVID-19 in humans.

In 2021, we recognized approximately $34.5 million in revenue from the sale of quantities of CDX-616 to Pfizer. In addition, as of December 31, 2021, we have received additional purchase orders from Pfizer for delivery of a significant quantity of CDX-616 in 2022. We have received and currently expect to receive additional purchase orders from Pfizer for significant quantities of CDX-616 during the course of 2022 for delivery in 2022 and 2023. As of December 31, 2021, we have not yet executed a long-term purchase and sale agreement with Pfizer for CDX-616; with or without a long-term purchase and sale agreement, we currently expect that future orders for quantities of CDX-616 by Pfizer will continue to be based on the needs of Pfizer for quantities of CDX-616 and there will be no minimum purchase obligation on the part of Pfizer.

Business Segments

We manage our business as two business segments: Performance Enzymes and Novel Biotherapeutics. See Note 15, "Segment, Geographical and Other Revenue Information" in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K.

Performance Enzymes

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the manufacture of small molecule pharmaceuticals and, to date, this continues to be our largest market served. Our customers, which include many large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development. We have also used the technology to develop customized enzymes for use in other industrial markets. These markets consist of several large industrial verticals, including food, feed, consumer care, and fine chemicals. We also use our technology in the life sciences markets to develop enzymes for customers using NGS and PCR/qPCR for in vitro molecular diagnostic and molecular biology research applications, as well DNA/RNA synthesis and health monitoring applications.

Novel Biotherapeutics

We are also targeting new opportunities in the pharmaceutical industry to discover, improve, and/or develop biotherapeutic drug candidates. We believe that our CodeEvolver® protein engineering platform technology can be used to discover novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability or immunogenicity.

Business Update Regarding COVID-19

We are subject to risks and uncertainties as a result of the current COVID-19 pandemic. The COVID-19 pandemic has presented a substantial public health and economic challenge around the world and is affecting our employees, communities and business operations, as well as the U.S. economy and other economies worldwide. The full extent to which the COVID-19 pandemic will directly or indirectly impact our business, results of operations and financial condition will depend on future developments that are highly uncertain and may not be accurately predicted, including the duration and severity of the pandemic, the prevalence of more contagious and or virulent variants such as the Delta and Omicron variants, and the extent and severity of the impact on our customers, new information that may emerge concerning COVID-19, the actions taken to contain it or treat its impact and the economic impact on local, regional, national and international markets.

In the United States, the impact of COVID-19, including governmental orders ("Orders") governing the operation of businesses during the pandemic, caused the temporary closure of our Redwood City, California facilities and has disrupted our R&D operations. R&D operations for several projects were temporarily suspended from mid-March 2020 through the end of April 2020 in accordance with these Orders. In May 2020, we re-initiated limited R&D operations and have ramped up operations such that we are currently utilizing our normal R&D capacity while following county, state and federal COVID-19 guidance for the protection of our employees. Additionally, we resumed manufacturing at our Redwood City pilot plant in May 2020.

To date, we and our collaboration partners have been able to continue to supply our enzymes to our customers worldwide, however, there can be no guarantee this will continue. Furthermore, our ability to provide future R&D services will continue to be impacted as a result of governmental orders and any disruptions in operations of our customers with whom we collaborate. We believe that these disruptions have had a minimal impact on revenue for the year ended December 31, 2021. The extent to which the pandemic may impact our business operations and operating results will continue to remain highly dependent on future developments, which are uncertain and cannot be predicted with confidence.

As a result of the COVID-19 pandemic we have received purchase orders from Pfizer for large quantities of our proprietary enzyme product, CDX-616, for use by Pfizer in the manufacture of a critical intermediate for its proprietary active pharmaceutical ingredient, nirmatrelvir, used by Pfizer in combination with the active pharmaceutical ingredient ritonavir, as its PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets) product for the treatment of COVID-19 infections in humans. These purchase orders have had substantial impact on our revenue in 2021.

For additional information on the various risks posed by the COVID-19 pandemic, please read Item 1A. Risk Factors included in this Annual Report on Form 10-K.

Recent Investing and Financing Activities

In June 2020, we entered into a Stock Purchase Agreement with MAI pursuant to which we purchased 1,587,050 shares of MAI's Series A preferred stock for $1.0 million. In connection with the transaction, John Nicols, our President and Chief Executive Officer, also joined MAI's board of directors. Concurrently with our initial equity investment, we entered into the MAI Agreement pursuant to which we are performing services utilizing our CodeEvolver® protein engineering platform technology to improve DNA polymerase enzymes in exchange for compensation in the form of additional shares of MAI's Series A preferred stock. In April 2021, we purchased an additional 1,000,000 shares of MAI's Series A preferred stock for $0.6 million. In September 2021, we purchased 9,198,423 shares of MAI's Series B preferred stock for $7.0 million. As of December 31, 2021, we have 16,705,320 shares of MAI's Series A and B preferred stock that we have earned or purchased since executing the Stock Purchase Agreement with MAI.

In November 2020, we announced the SynBio Innovation Accelerator ("Accelerator") collaboration with Casdin Capital, LLC ("Casdin"). The goal of the Accelerator is to fund the early-stage companies with disruptive technology platforms or unique product development capabilities in the field of synthetic and industrial biotechnology. The first investment by Codexis associated with the Accelerator collaboration was made in Arzeda Corp., a privately-held computational protein design company that focuses on computational approaches to designing novel enzyme functionality. We invested $1.0 million in Arzeda and received a convertible subordinated note issued by Arzeda Corp. In July 2021, we converted the non-marketable debt security with a carrying value of $1.3 million into 207,070 shares of Series B-2 preferred stock of Arzeda Corp.

In December 2020, we completed an underwritten public offering of 4,928,572 shares of our common stock, par value $0.0001 per share, at a public offering price of $17.50 per share. The net proceeds to us were approximately $80.8 million after deducting offering costs, underwriting discounts and commissions and other offering expenses of $5.5 million.

In May 2021, we filed a Registration Statement on Form S-3 with the SEC, that automatically became effective upon its filing, under which we may sell common stock, preferred stock, debt securities, warrants, purchase contracts, and units from time to time in one or more offerings. In May 2021, we entered into an Equity Distribution Agreement ("EDA") with Piper Sandler & Co ("PSC"), under which PSC, as our exclusive agent, at our discretion and at such times that we may determine from time to time, may sell over a three-year period from the execution of the EDA up to a maximum of $50.0 million of shares of our common stock. Under the terms of the EDA, PSC may sell the shares at market prices by any method that is deemed to be an "at the market offering" as defined in Rule 415 under the Securities Act of 1933, as amended. During the year ended December 31, 2021, no shares of our common stock were issued pursuant to the EDA.

Results of Operations Overview

Revenues were $104.8 million in 2021, a 52% increase from $69.1 million in 2020. Product revenue, which consists primarily of sales of biocatalysts, pharmaceutical intermediates, and Codex® biocatalyst panels and kits, was $70.7 million in 2021, an increase of 134% compared with $30.2 million in 2020. The increase in product revenue was primarily due to $34.5 million in revenue from Pfizer related to the purchase of our performance enzyme products and an increase in demand for enzymes used in the manufacture of branded pharmaceutical products.

Research and development revenues, which include license, technology access and exclusivity fees, research service fees, milestone payments, royalties, and optimization and screening fees, totaled $34.1 million in 2021, a 12% decrease compared with $38.8 million in 2020. The decrease in research and development revenue was primarily due to lower license fees from Takeda under the Takeda Agreement and lower revenues from Novartis under the Novartis CodeEvolver® Agreement recognized this year compared to the prior year, partially offset by higher license fees from other existing collaboration agreements.

Our products' profitability is affected by many factors including the mix of products we sell. Our profit margins are affected by many factors including the costs of internal and third-party fixed and variable costs, including materials and supplies, labor, facilities and other overhead costs. Profit margin data is used as a management performance measure to provide additional information regarding our results of operations on a consolidated basis. Product gross margins increased to 69% in 2021, compared to 55% in 2020 due to improved product mix resulting from sales to Pfizer and an increase in customer demand for branded pharmaceutical products.

Research and development expenses were $55.9 million in 2021, an increase of 26% from $44.2 million in 2020. The increase was primarily due to an increase in costs associated with higher headcount, higher lab supplies, higher depreciation and other outside services, partially offset by a decrease in costs associated with outside services relating to Chemistry, Manufacturing and Controls ("CMC") and regulatory expenses.

Selling, general and administrative expenses were $49.3 million in 2021, an increase of 41% compared to $35.0 million in 2020. The increase was primarily due to an increase in costs associated with a higher headcount, increase in legal fees, higher stock-based compensation costs, higher outside and temporary services, partially offset by lower allocable expenses.

Net loss was $21.3 million, or a net loss of $0.33 per share, in 2021 compared to a net loss of $24.0 million, or a net loss of $0.40 per share, in 2020. The decrease in net loss was primarily related to an increase in product revenue with higher margins, partially offset by higher operating expenses and lower research and development revenues.

Cash and cash equivalents decreased to $116.8 million as of December 31, 2021 compared to $149.1 million as of December 31, 2020. In addition, net cash used in operations was $14.3 million in 2021, as compared to net cash used in operations of $16.5 million in 2020. We believe that based on our current level of operations, our existing cash and cash equivalents will provide adequate funds for ongoing operations, planned capital expenditures and working capital requirements for at least the next 12 months.

In June 2017, we entered into a loan and security agreement with Western Alliance Bank that allowed us to borrow up to $10.0 million under a term loan, and allow us to borrow up to $5.0 million under a revolving credit facility with 80% of certain eligible accounts receivable as a borrowing base (the "Credit Facility"). Obligations under the Credit Facility are secured by a lien on substantially all of our personal property other than our intellectual property. In September 2021, we entered into the Ninth Amendment to the Credit Facility whereby we may draw on the term debt and the Revolving Line of Credit at any time prior to December 31, 2021 and October 1, 2024, respectively. Draws on the term debt are subject to customary conditions for funding. Our ability to take draws on the term debt expired on December 31, 2021. As of December 31, 2021, no amounts were borrowed under the Credit Facility and we were in compliance with the covenants for the Credit Facility. See Note 13, "Commitments and Contingencies" in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K.

Recent Accounting Pronouncements

For information on recent accounting pronouncements, see Note 2, "Summary of Significant Accounting Policies" in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K.

Results of Operations

The following table shows the amounts from our consolidated statements of operations for the periods presented (in thousands, except percentages):

	Year Ended December 31,			% of Total Revenues		
	2021	2020	2019	2021	2020	2019
Revenues:						
Product revenue	$ 70,657	$ 30,220	$ 29,465	67 %	44 %	43 %
Research and development revenue	34,097	38,836	38,993	33 %	56 %	57 %
Total revenues	104,754	69,056	68,458	100 %	100 %	100 %
Costs and operating expenses:						
Cost of product revenue	22,209	13,742	15,632	21 %	20 %	23 %
Research and development	55,919	44,185	33,873	53 %	64 %	49 %
Selling, general and administrative	49,323	35,049	31,502	47 %	51 %	46 %
Total costs and operating expenses	127,451	92,976	81,007	121 %	135 %	118 %
Loss from operations	(22,697)	(23,920)	(12,549)	(21)%	(35)%	(18)%
Interest income	459	405	1,287	— %	1 %	2 %
Other income (expense), net	1,148	(156)	(656)	1 %	— %	(1)%
Loss before income taxes	(21,090)	(23,671)	(11,918)	(20)%	(34)%	(17)%
Provision for income taxes	189	339	17	— %	— %	— %
Net loss	$ (21,279)	$ (24,010)	$ (11,935)	(20)%	(34)%	(17)%

Revenues

Our revenues consist of product revenue and research and development revenue as follows:

- Product revenue consist of sales of biocatalysts, pharmaceutical intermediates, and Codex® biocatalyst panels and kits.
- Research and development revenue include license, technology access and exclusivity fees, research services fees, milestone payments, royalties, optimization and screening fees.

Revenues are as follows (in thousands, except percentages):

	Year Ended December 31,			Change			
				2021		2020	
	2021	2020	2019	$	%	$	%
Product revenue	$ 70,657	$ 30,220	$ 29,465	$ 40,437	134 %	$ 755	3 %
Research and development revenue	34,097	38,836	38,993	(4,739)	(12)%	(157)	— %
Total revenues	$ 104,754	$ 69,056	$ 68,458	$ 35,698	52 %	$ 598	1 %

Revenues typically fluctuate on a quarterly basis due to the variability in our customers' manufacturing schedules and the timing of our customers' clinical trials. In addition, we have limited internal capacity to manufacture enzymes. As a result, we are dependent upon the performance and capacity of third party manufacturers for the commercial scale manufacturing of the enzymes used in our pharmaceutical and fine chemicals business.

We accept purchase orders for deliveries covering periods from one day up to 14 months from the date on which the order is placed. However, some of our purchase orders can be revised or cancelled by the customer without penalty. Considering

these industry practices and our experience, we do not believe the total of customer purchase orders outstanding (backlog) provides meaningful information that can be relied on to predict actual sales for future periods.

2021 compared to 2020

Total revenues increased by $35.7 million in 2021 to $104.8 million, as compared to 2020. The increase was driven by growth in product revenue of $40.4 million, or 134%, but partially offset by a decrease in research and development revenue of $4.7 million, or 12%.

Product revenues, which consist primarily of sales of biocatalysts, pharmaceutical intermediates, and Codex® biocatalyst panels and kits, were $70.7 million in 2021, an increase of 134% compared with $30.2 million in 2020. The increase in product revenue was primarily due to $34.5 million in revenue from Pfizer and an increase in demand for enzymes used in the manufacture of branded pharmaceutical products.

Research and development revenue decreased by $4.7 million in 2021 to $34.1 million, or 12% compared with $38.8 million in 2020, primarily due to lower license and research and development fees from Takeda under the Takeda Agreement and lower revenues from the Novartis CodeEvolver® Agreement recognized this year compared to the prior year, partially offset by higher license fees from other existing collaboration agreements.

2020 compared to 2019

Total revenues increased by $0.6 million in 2020 to $69.1 million, as compared to 2019. The increase was driven by growth in product revenue of $0.8 million, or 3%, offset by a decrease in research and development revenue of $0.2 million or nominal percent.

Product revenues were $30.2 million in 2020, an increase of 3% compared with $29.5 million in 2019. The increase in product revenue is primarily due to higher customer demand for enzymes used in the manufacture of branded pharmaceutical products.

Research and development revenues decreased by $0.2 million in 2020 to $38.8 million compared with 39.0 million in 2019, primarily due to lower revenues from the Novartis CodeEvolver® Agreement, a prior year functional license fee revenue from Nestlé Health Science, and a prior year milestone payment from GSK under the GSK CodeEvolver® Agreement, partially offset by the recognition of license fees from Takeda under the Takeda Agreement, and recognition of functional license fees revenue from Porton.

Cost and Operating Expenses (in thousands, except percentages):

	Year Ended December 31,			Change			
				2021		2020	
	2021	2020	2019	$	%	$	%
Cost of product revenue	$ 22,209	$ 13,742	$ 15,632	$ 8,467	62 %	$ (1,890)	(12)%
Research and development	55,919	44,185	33,873	11,734	26 %	10,312	30 %
Selling, general and administrative	49,323	35,049	31,502	14,274	41 %	3,547	11 %
Total costs and operating expenses	$ 127,451	$ 92,976	$ 81,007	$ 34,475	37 %	$ 11,969	15 %

Cost of Product Revenue and Product Gross Margin

Our product revenues are derived entirely from our Performance Enzymes segment. Revenues from the Novel Biotherapeutics segment are only from collaborative research and development activities.

The following table shows the amounts of our product revenue, cost of product revenue, product gross profit and product gross margin from our consolidated statements of operations for the years ended (in thousands, except percentages):

	Year Ended December 31,		Change		Year Ended December 31,		Change	
	2021	2020	$	%	2020	2019	$	%
Product revenue	$ 70,657	$ 30,220	$ 40,437	134 %	$ 30,220	$ 29,465	$ 755	3 %
Cost of product revenue [1]	22,209	13,742	8,467	62 %	13,742	15,632	(1,890)	(12)%
Product gross profit	$ 48,448	$ 16,478	$ 31,970	194 %	$ 16,478	$ 13,833	$ 2,645	19 %
Product gross margin (%) [2]	69 %	55 %			55 %	47 %		

[1] Cost of product revenue comprises both internal and third-party fixed and variable costs, including materials and supplies, labor, facilities and other overhead costs associated with our product revenue.

[2] Product gross margin is used as a performance measure to provide additional information regarding our results of operations on a consolidated basis.

2021 compared to 2020

Cost of product revenue increased by $8.5 million in 2021 to $22.2 million, as compared to 2020. The increase was primarily due to a higher volume of product sales and variations in product mix. The product gross margin increased to 69% in 2021 as compared to 55% in 2020, primarily due to the sale of higher margin branded products.

2020 compared to 2019

Cost of product revenue decreased by $1.9 million in 2020 to $13.7 million, as compared to 2019. The decrease was primarily due to lower costs compared to costs associated with prior year product revenue. The product gross margin increased to 55% in 2020 as compared to 47% in 2019 due to improved product mix.

Research and Development Expenses

Research and development expenses consist of costs incurred for internal projects as well as collaborative research and development activities. These costs primarily consist of (i) employee-related costs, which include salaries and other personnel-related expenses (including stock-based compensation), (ii) various allocable expenses, which include occupancy-related costs, supplies, depreciation of facilities and laboratory equipment, and (iii) external costs. Research and development expenses are expensed when incurred.

2021 compared to 2020

Research and development expenses were $55.9 million in 2021 compared to $44.2 million in 2020, an increase of $11.7 million, or 26%. The increase was primarily due to $7.6 million in costs associated with higher headcount, $0.8 million in higher stock-based compensation expenses, $2.6 million in higher lab supplies, $2.2 million in higher allocable expenses, $1.1 million increase in outside services, and $1.0 million in higher depreciation expenses, partially offset by a $3.7 million decrease in costs associated with outside services related to CMC and regulatory expenses.

2020 compared to 2019

Research and development expenses were $44.2 million in 2020 compared to $33.9 million in 2019, an increase of $10.3 million, or 30%. The increase was primarily due to $5.0 million in costs associated with outside services relating to CMC and regulatory expenses, $3.4 million in costs associated with higher headcount, $1.5 million in higher allocable expenses which include occupancy-related costs and supplies, $0.4 million in higher outside services, and $0.3 million in higher depreciation expense and were partially offset by a decrease of $0.4 million in lab supply expenses.

Selling, General and Administrative Expenses

Selling, general and administrative expenses consist of employee-related costs, which include salaries and other personnel-related expenses (including stock-based compensation), hiring and training costs, consulting and outside services expenses (including audit and legal counsel related costs), marketing costs, building lease costs, and depreciation and amortization expenses.

2021 compared to 2020

Selling, general and administrative expenses were $49.3 million in 2021 compared to $35.0 million in 2020, an increase of $14.3 million, or 41%. The increase was primarily due to an increase of $6.6 million in costs associated with higher headcount to support our growth, $3.1 million in higher stock-based compensation costs, $5.1 million increase in legal fees, $1.1 million in higher outside and temporary services, $1.0 million in higher facilities cost, and $0.4 million increase in allowance for credit losses, partially offset by a decrease of $3.0 million in allocable expenses.

2020 compared to 2019

Selling, general and administrative expenses were $35.0 million in 2020 compared to $31.5 million in 2019, an increase of $3.5 million or 11%. The increase was primarily due to increases of $1.7 million in salaries and personnel costs associated with higher headcount, $0.6 million in stock-based compensation expense, $0.8 million in consultants costs, $0.8 million in legal and accounting fees, $0.7 million in facilities costs, $0.7 million in outside and temporary services, and $0.4 million in licensed technology, which were partially offset by decreases of $1.6 million in allocable expenses and $0.8 million in travel expenses.

Interest Income and Other Income (Expense), net (in thousands, except percentages):

	Year Ended December 31,			Change			
				2021		2020	
	2021	2020	2019	$	%	$	%
Interest income	$ 459	$ 405	$ 1,287	$ 54	13 %	$ (882)	(69)%
Other income (expense), net	1,148	(156)	(656)	1,304	836 %	500	76 %
Total other income (expense), net	$ 1,607	$ 249	$ 631	$ 1,358	545 %	$ (382)	(61)%

Interest Income

Interest income increased by $0.1 million in 2021 compared to 2020, primarily due to earned interest income on a non-marketable debt security, partially offset by a reduction in interest income from lower average interest rates on lower average cash balances. Interest income decreased by $0.9 million in 2020 compared to 2019, primarily due to lower average interest rates on declining average cash balances.

Other Income (Expense), net

Other income (expense), net, increased by $1.3 million in 2021 compared to 2020, primarily due to a $1.0 million gain from remeasurement on the carrying value of our investment in MAI. Other expense decreased by $0.5 million in 2020 compared to 2019, primarily due to a $0.5 million write-down in the fair value of our investment in CO_2 Solutions and fluctuations in foreign currency in 2019.

Provision for Income Taxes (in thousands, except percentages):

	Year Ended December 31,			Change			
				2021		2020	
	2021	2020	2019	$	%	$	%
Provision for income taxes	$ 189	$ 339	$ 17	$ (150)	(44)%	322	1,894 %

The provision for income taxes for 2021 was primarily due to the income tax withholding imposed by foreign taxing authorities on income earned in certain countries outside of the Unites States and remitted to the Unites States and the accrual of interest and penalties on historic uncertain tax positions. The provision for income taxes in 2020 was primarily due to foreign withholding taxes on certain sales to non-U.S. customers. The provision for income taxes in 2019 was primarily due to the accrual of interest and penalties on historic uncertain tax positions.

Net Loss

Net loss for 2021 was $21.3 million, or a net loss per basic and diluted share of $0.33. This compared to a net loss of $24.0 million, or $0.40 per basic and diluted share for 2020. The decrease in net loss was primarily related to an increase in product revenue with higher margins, partially offset by higher operating expenses and lower research and development revenues.

The net loss for 2020 was $24.0 million, or $0.40 per basic and diluted share. This compared to a net loss of $11.9 million, or $0.21 per basic and diluted share for 2019. The increase in net loss was primarily related to an increase in costs associated with outside services relating to CMC and regulatory expenses, higher headcount, higher consultants, higher stock compensation expenses and higher facility expense.

Results of Operations by Segment (in thousands, except percentages)

Revenues by segment

	Year Ended December 31, 2021			Year Ended December 31, 2020			Change			
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes		Novel Biotherapeutics	
							$	%	$	%
Revenues:										
Product revenue	$ 70,657	$ —	$ 70,657	$ 30,220	$ —	$ 30,220	$ 40,437	134 %	$ —	— %
Research and development revenue	19,858	14,239	34,097	17,886	20,950	38,836	1,972	11 %	(6,711)	(32)%
Total revenues	$ 90,515	$ 14,239	$ 104,754	$ 48,106	$ 20,950	$ 69,056	$ 42,409	88 %	$ (6,711)	(32)%

	Year Ended December 31, 2020			Year Ended December 31, 2019			Change			
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes		Novel Biotherapeutics	
							$	%	$	%
Revenues:										
Product revenue	$ 30,220	$ —	$ 30,220	$ 29,465	$ —	$ 29,465	$ 755	3 %	$ —	— %
Research and development revenue	17,886	20,950	38,836	28,691	10,302	38,993	(10,805)	(38)%	10,648	103 %
Total revenues	$ 48,106	$ 20,950	$ 69,056	$ 58,156	$ 10,302	$ 68,458	$ (10,050)	(17)%	$ 10,648	103 %

2021 compared to 2020

Revenues from the Performance Enzymes segment increased by $42.4 million, or 88%, to $90.5 million in 2021, compared to $48.1 million in 2020. The increase in product revenue of $40.4 million, or 134%, to $70.7 million in 2021, compared to $30.2 million in 2020 was primarily due to $34.5 million in revenue from Pfizer and higher customer demand for enzymes used in the manufacture of branded pharmaceutical products. The increase in research and development revenue of $2.0 million, or 11%, to $19.9 million in 2021, compared to $17.9 million in 2020 was primarily due to higher licenses fees from existing collaboration arrangements, partially offset by lower revenues from Novartis under the Novartis CodeEvolver® Agreement.

Revenues from the Novel Biotherapeutics segment decreased by $6.7 million, or 32%, to $14.2 million in 2021, compared to $21.0 million in 2020. The decrease in revenue was primarily due to lower license and research and development fees from Takeda under the Takeda Agreement recognized this year compared to the prior year and a decrease in research and development revenue from Nestlé Health Science compared to last year.

2020 compared to 2019

Revenues from the Performance Enzymes segment decreased by $10.1 million, or 17%, to $48.1 million in 2020, compared to $58.2 million in 2019. The increase in product revenue of $0.8 million, or 3%, to $30.2 million in 2020, compared to $29.5 million in 2019, was primarily due to higher customer demand for enzymes used in the manufacture of branded pharmaceutical products. The decrease in research and development revenue of $10.8 million, or 38%, to $17.9 million in 2020, compared to $28.7 million in 2019 was primarily due to lower revenues from Novartis under the Novartis CodeEvolver® Agreement, a prior year milestone payment from GSK under the GSK CodeEvolver® Agreement, and lower license fees and revenue from Merck, partially offset by the recognition of functional license fees revenue from Porton in 2020.

Revenues from the Novel Biotherapeutics segment increased by $10.6 million, or 103%, to $21.0 million in 2020, compared to $10.3 million in 2019. The increase in revenue was primarily due to recognition of license fees from Takeda under the Takeda Agreement, partially offset by a decrease in prior year functional license fee revenue from Nestlé Health Science.

Costs and operating expenses by segment

	Year Ended December 31, 2021			Year Ended December 31, 2020			Change			
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes		Novel Biotherapeutics	
							$	%	$	%
Cost of product revenue	$ 22,209	$ —	$ 22,209	$ 13,742	$ —	$ 13,742	$ 8,467	62%	$ —	—%
Research and development[1]	23,140	30,219	53,359	20,923	21,705	42,628	2,217	11%	8,514	39%
Selling, general and administrative[1]	12,105	2,755	14,860	9,597	2,355	11,952	2,508	26%	400	17%
Total segment costs and operating expenses	$ 57,454	$ 32,974	90,428	$ 44,262	$ 24,060	68,322	$ 13,192	30%	$ 8,914	37%
Corporate costs[2]			33,808			22,555				
Unallocated depreciation and amortization			3,215			2,099				
Total costs and operating expenses			$ 127,451			$ 92,976				

[1] Research and development expenses and selling, general and administrative expenses exclude depreciation and amortization of finance leases.
[2] Corporate costs include unallocated selling, general and administrative expenses.

	Year Ended December 31, 2020			Year Ended December 31, 2019			Change			
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes		Novel Biotherapeutics	
							$	%	$	%
Cost of product revenue	$ 13,742	$ —	$ 13,742	$ 15,632	$ —	$ 15,632	$ (1,890)	(12)%	$ —	—%
Research and development[1]	20,923	21,705	42,628	19,380	13,278	32,658	1,543	8%	8,427	63%
Selling, general and administrative[1]	9,597	2,355	11,952	8,462	2,222	10,684	1,135	13%	133	6%
Total segment costs and operating expenses	$ 44,262	$ 24,060	68,322	$ 43,474	$ 15,500	58,974	$ 788	2%	$ 8,560	55%
Corporate costs[2]			22,555			20,255				
Unallocated depreciation and amortization			2,099			1,778				
Total costs and operating expenses			$ 92,976			$ 81,007				

[1] Research and development expenses and selling, general and administrative expenses exclude depreciation and amortization of finance leases.
[2] Corporate costs include unallocated selling, general and administrative expenses.

For a discussion of product cost of revenue, see *"Results of Operations"*.

2021 compared to 2020

Research and development expense in the Performance Enzymes segment increased by $2.2 million, or 11%, to $23.1 million in 2021, compared to $20.9 million in 2020. The increase was primarily due to an increase in costs associated with higher headcount, higher outside services expenses, and higher lab supplies, partially offset by lower allocable expenses.

Selling, general and administrative expense in the Performance Enzymes segment increased by $2.5 million, or 26%, to $12.1 million in 2021, compared to $9.6 million in 2020. The increase was primarily due to an increase in costs associated with higher headcount and allocable expenses, partially offset by lower outside services expenses.

Research and development expense in the Novel Biotherapeutics segment increased by $8.5 million, or 39%, to $30.2 million in 2021, compared to $21.7 million in 2020. The increase was primarily due to higher costs associated with higher headcount and allocable expenses but partially offset by reduction in costs associated with outside services relating to CMC and regulatory expenses.

Selling, general and administrative expense in the Novel Biotherapeutics segment increased by $0.4 million, or 17%, to $2.8 million in 2021, compared to $2.4 million in 2020. The increase was primarily due to increase in costs associated with higher headcount and higher allocable expenses, partially offset by lower outside services expenses.

2020 compared to 2019

Research and development expense in the Performance Enzymes segment increased by $1.5 million, or 8%, to $20.9 million in 2020, compared to $19.4 million in 2019. The increase was primarily due to an increase in costs associated with higher headcount, higher stock-based compensation expense, higher repairs and maintenance expense, and were partially offset by lower lab supply expenses and lower allocable expenses.

Selling, general and administrative expense in the Performance Enzymes segment increased by $1.1 million, or 13%, to $9.6 million in 2020, compared to $8.5 million in 2019. The increase was primarily due to an increase in costs associated with licensed technology, outside services, stock-based compensation expense, and higher allocable expenses which were partially offset by lower travel expenses.

Research and development expense in the Novel Biotherapeutics segment increased by $8.4 million, or 63%, to $21.7 million in 2020, compared to $13.3 million in 2019. The increase was primarily due to an increase in costs associated with outside services relating to CMC and regulatory expenses for CDX-7108 which we are developing pursuant to our development agreement with Nestlé Health Science, higher headcount, higher outside services, and higher allocable expenses and were partially offset by lower lab supply expenses and consultant expense.

Selling, general and administrative expense in the Novel Biotherapeutics segment increased by $0.1 million, or 6%, to $2.4 million in 2020, compared to $2.2 million in 2019. The increase was primarily due to an increase in costs associated with headcount, licensed technology, consultants and stock-based compensation expense which were partially offset by lower allocable expenses, outside services, and travel expenses.

Income (loss) from operations by segment

	Year Ended December 31, 2021			Year Ended December 31, 2020			Change			
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes		Novel Biotherapeutics	
							$	%	$	%
Income (loss) from operations	$ 33,061	$ (18,735)	$ 14,326	$ 3,844	$ (3,110)	$ 734	$ 29,217	760%	$ (15,625)	(502)%

	Year Ended December 31, 2020			Year Ended December 31, 2019			Change			
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes		Novel Biotherapeutics	
							$	%	$	%
Income (loss) from operations	$ 3,844	$ (3,110)	$ 734	$ 14,682	$ (5,198)	$ 9,484	$ (10,838)	(74)%	$ 2,088	40%

2021 compared to 2020

Income from operations in the Performance Enzymes segment increased by $29.2 million, or 760%, to $33.1 million, in 2021, compared to $3.8 million in 2020. The increase in income from operations was primarily due to higher product revenue and research and development revenue, partially offset by higher costs and operating expenses.

Loss from operations in the Novel Biotherapeutics segment increased by $15.6 million, or 502%, to $18.7 million in 2021 compared to a loss from operations of $3.1 million in 2020. The increase in loss from operations was primarily due to lower

research and development revenue from Takeda under the Takeda Agreement and decrease in research and development revenue from Nestlé Health Science, and higher research and development expenses associated with higher headcount and allocable expenses.

2020 compared to 2019

Income from operations in the Performance Enzymes segment decreased by $10.8 million, or 74%, to $3.8 million, in 2020, compared to $14.7 million in 2019. The decrease in income from operations was primarily due to decrease in research and development revenue and increases in research and development costs and selling, general and administrative expenses.

Loss from operations in the Novel Biotherapeutics segment decreased by $2.1 million, or 40%, to $3.1 million in 2020 compared to a loss from operations of $5.2 million in 2019. The decrease in loss from operation was primarily due to the recognition of license fees from Takeda under the Takeda Agreement, partially offset by a decrease in prior year functional license fee revenue from Nestlé Health Science, an increase in costs associated with outside services relating to CMC and regulatory expenses, higher headcount, higher outside services, and higher allocable expenses.

Liquidity and Capital Resources

Liquidity is the measurement of our ability to meet working capital needs and to fund capital expenditures. We have historically funded our operations primarily through cash generated from operations, stock option exercises and public and private offerings of our common stock. We also have the ability to borrow up to $5.0 million under our Credit Facility. We actively manage our cash usage and investment of liquid cash to ensure the maintenance of sufficient funds to meet our working capital needs. Our cash and cash equivalents are held in U.S banks.

The following summarizes our cash and cash equivalents balance and working capital as of December 31, 2021, 2020 and 2019 (in thousands):

	December 31,		
	2021	2020	2019
Cash and cash equivalents	$ 116,797	$ 149,117	$ 90,498
Working capital	$ 128,517	$ 159,442	$ 98,817

Sources of Capital

In addition to our existing cash and cash equivalents, we are eligible to earn milestone and other contingent payments for the achievement of defined collaboration objectives and certain royalty payments under our collaboration agreements. Our ability to earn these milestone and contingent payments and the timing of achieving these milestones is primarily dependent upon the outcome of our collaborators' research and development activities and is uncertain at this time. Under the Merck CodeEvolver® Agreement, we are eligible to receive payments of up to $15.0 million for each commercial API that is manufactured by Merck using one or more novel enzymes developed by Merck using the CodeEvolver® technology. In addition, under the GSK CodeEvolver® Agreement, depending upon GSK's successful application of the licensed technology, we have the potential to receive additional contingent payments that range from $5.75 million to $38.5 million per project.

In May 2019, we entered into a Platform Technology Transfer and License Agreement with Novartis. The Novartis CodeEvolver® Agreement allows Novartis to use Codexis' proprietary CodeEvolver® protein engineering platform technology in the field of human healthcare. Pursuant to the agreement, we received an upfront payment of $5.0 million shortly after the effective date. We completed the second technology milestone transfer under the agreement and received a milestone payment of $4.0 million in 2020. We have also received aggregate of $5.0 million for the completion of the third technology milestone in 2021. In consideration for the continued disclosure and license of improvements to the technology and materials during a multi-year period that began on the conclusion of the Technology Transfer Period ("Improvements Term"), Novartis will pay Codexis an additional $8.0 million in aggregate over four years.

In October 2017, we entered into the Nestlé License Agreement with Nestlé Health Science. Pursuant to the Nestlé License Agreement, Nestlé Health Science paid us an upfront cash payment and milestone payments after dosing the first subjects in a first-in-human Phase 1a dose-escalation trail with CDX-6114 and achievement of a formulation relating to CDX-6114. We are also eligible to receive payments from Nestlé Health Science under the Nestlé License Agreement that include (i) development and approval milestones of up to $85.0 million, (ii) sales-based milestones of up to $250.0 million in the aggregate, which aggregate amount is achievable if net sales exceed $1.0 billion in a single year, and (iii) tiered royalties, at percentages ranging from the mid-single digits to low double-digits, of net sales of product.

We are actively collaborating with new and existing customers in the pharmaceutical and food industries. We believe that we can utilize our current products and services, and develop new products and services, to increase our revenues and gross margins in future periods.

We have historically experienced negative cash flows from operations as we continue to invest in key technology development projects and improvements to our CodeEvolver® protein engineering technology platform, and expand our business development and collaboration with new customers. Our cash flows from operations will continue to be affected principally by product sales and product gross margins, sales from licensing our technology to major pharmaceutical companies, and collaborative research and development services provided to customers, as well as our headcount costs, primarily in research and development. Our primary source of cash flows from operating activities is cash receipts from our customers for purchases of products, collaborative research and development services, and licensing our technology to major pharmaceutical companies. Our largest uses of cash from operating activities are for employee-related expenditures, rent payments, inventory purchases to support our product sales and non-payroll research and development costs.

Equity Distribution Agreement

In May 2021, we entered into an Equity Distribution Agreement ("EDA") with Piper Sandler & Co ("PSC"), under which PSC, as our exclusive agent, at our discretion and at such times that we may determine from time to time, may sell over a three-year period from the execution of the EDA up to a maximum of $50.0 million of shares of our common stock. During the year ended December 31, 2021, no shares of our common stock were issued pursuant to the EDA. As of December 31, 2021, $50.0 million of shares remained available for sale under the EDA. Sales of our common stock under this arrangement could be subject to business, economic or competitive uncertainties and contingencies, many of which may be beyond our control, and which could cause actual results from the sale of our common stock to differ materially from expectations.

Credit Facility

In June 2017, we entered into the Credit Facility with Western Alliance Bank which consists of term debt for loans that allowed us to borrow up to $10.0 million and a revolving credit facility that allows us to borrow up to $5.0 million with a certain eligible accounts receivable borrowing base of 80% of eligible accounts receivable. In September 2021, we entered into the Ninth Amendment to the Credit Facility whereby we may draw on the Term Debt and the Revolving Line of Credit at any time prior to December 31, 2021 and October 1, 2024, respectively, subject to customary conditions for funding including, among others, that no event of default exists. Draws on the Credit Facility are secured by a lien on substantially all of our personal property other than our intellectual property. On October 1, 2024, loans drawn under the Term Debt mature and the Revolving Line of Credit terminate. Our right to take draws on the term debt expired on December 31, 2021 and no amounts were drawn under the Credit Facility as of December 31, 2021. The Credit Facility requires us to maintain compliance with certain financial covenants including attainment of certain lender-approved projections or maintenance of certain minimum cash levels. Restrictive covenants in the Credit Facility restrict the payment of dividends or other distributions. At December 31, 2021, we were in compliance with the covenants for the Credit Facility. For additional information about our contractual obligations, see Note 13, “Commitments and Contingencies” in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K.

We believe that, based on our current level of operations, our existing cash and cash equivalents will provide adequate funds for ongoing operations, planned capital expenditures and working capital requirements for at least the next 12 months.

However, we may need additional capital if our current plans and assumptions change. In addition, we may choose to seek other sources of capital even if we believe we have generated sufficient cash flows to support our operating needs. Our need for additional capital will depend on many factors, including the financial success of our business, the spending required to develop and commercialize new and existing products, the effect of any acquisitions of other businesses, technologies or facilities that we may make or develop in the future, our spending on new market opportunities, and the potential costs for the filing, prosecution, enforcement and defense of patent claims, if necessary. If our capital resources are insufficient to meet our capital requirements, and we are unable to enter into or maintain collaborations with partners that are able or willing to fund our development efforts or commercialize any products that we develop or enable, we will have to raise additional funds to continue the development of our technology and products and complete the commercialization of products, if any, resulting from our technologies. If future financings involve the issuance of equity securities, our existing stockholders would suffer dilution. If we raise debt financing or enter into credit facilities, we may be subject to restrictive covenants that limit our ability to conduct our business. We may not be able to raise sufficient additional funds on terms that are favorable to us, if at all. If we fail to raise sufficient funds and fail to generate sufficient revenues to achieve planned gross margins and to control operating costs, our ability to fund our operations, take advantage of strategic opportunities, develop products or technologies, or otherwise respond to competitive pressures could be significantly limited. If this happens, we may be forced to delay or terminate research or development programs or the commercialization of products resulting from our technologies, curtail or cease operations or obtain funds through collaborative and licensing arrangements that may require us to relinquish commercial rights, or grant licenses on terms that are not favorable to us. If adequate funds are not available, we will not be able to successfully execute our business plan or continue our business.

Cash Flows

The following is a summary of cash flows for the years ended December 31, 2021, 2020 and 2019 (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Net cash used in operating activities	$ (14,267)	$ (16,464)	$ (12,560)
Net cash used in investing activities	(21,422)	(5,748)	(3,665)
Net cash provided by financing activities	3,767	80,808	53,961
Net increase (decrease) in cash, cash equivalents and restricted cash	$ (31,922)	$ 58,596	$ 37,736

Cash Flows from Operating Activities

Cash used in operating activities was $14.3 million in 2021, which resulted from a net loss of $21.3 million adjusted for non-cash charges for depreciation of $3.1 million, right-of-use ("ROU") lease asset amortization expense of $2.8 million, stock-based compensation of $11.6 million, $0.3 million allowance for credit losses, partially offset by equity securities earned from research and development activities of $2.0 million and unrealized gain on non-marketable securities of $1.3 million. Additionally, changes in operating assets and liabilities were $7.6 million. The net change in operating assets and liabilities included a decrease in other long-term liabilities of $4.1 million, increase in financial assets of $9.2 million, increase in prepaid expenses and other assets of $2.3 million, increase in inventories of $0.2 million, partially offset by increase in accrued compensation and other accrued liabilities of $6.6 million, increase in deferred revenue of $1.3 million and increase of $0.3 million in accounts payable.

Cash used in operating activities was $16.5 million in 2020, which resulted from a net loss of $24.0 million adjusted for non-cash charges for depreciation of $2.0 million, ROU lease asset amortization expense of $2.6 million and stock-based compensation of $7.7 million, as well as changes in operating assets and liabilities. The net change in operating assets and liabilities included decreases in other long-term liabilities of $2.6 million and combined increases in financial assets of $8.7 million, prepaid expenses and other assets of $1.0 million, as well as accrued compensation and other accrued liabilities of $6.2 million and deferred revenue of $2.7 million.

Cash used in operating activities was $12.6 million in 2019, which resulted from a net loss of $11.9 million adjusted for non-cash charges for depreciation of $1.6 million, ROU lease asset amortization expense of $3.0 million and stock-based compensation of $6.9 million, as well as changes in operating assets and liabilities. The net change in operating assets and liabilities included decreases in deferred revenue of $6.2 million and in other long-term liabilities of $1.2 million, and combined increases in financial assets of $5.9 million, prepaid expenses and other assets of $1.3 million, as well as accrued compensation and other accrued liabilities of $2.2 million.

Cash Flows from Investing Activities

Cash used in investing activities was $21.4 million in 2021 primarily due to the purchase of property and equipment of $13.8 million and for the purchase of 1,000,000 shares of MAI's Series A preferred stock in April 2021 and 9,198,423 shares of MAI's Series B preferred stock in September 2021 for $7.6 million.

Cash used in investing activities was $5.7 million in 2020 primarily due to the purchase of property and equipment of $3.7 million, and investments in non-marketable equity securities of $1.0 million and non-marketable debt securities of $1.0 million.

Cash used in investing activities was $3.7 million in 2019 primarily due to the purchase of property and equipment of $3.7 million and partially offset by proceeds from sale of CO_2 investment securities of $0.1 million.

Cash Flows from Financing Activities

Cash provided by financing activities was $3.8 million in 2021, primarily due to $5.2 million of proceeds from exercises of stock options, partially offset by $1.2 million for taxes paid related to net share settlement of equity awards and $0.2 million of costs incurred in connection with the EDA.

Cash provided by financing activities was $80.8 million in 2020, primarily due to $80.8 million net proceeds from our offering of common stock after deducting underwriting discounts and commission and related costs and proceeds from the exercises of employee stock options which were partially offset by the payment of taxes related to the net share settlement of equity awards

Cash provided by financing activities was $54.0 million in 2019, primarily due to net proceeds from our private offering of common stock after deducting underwriting discounts and commission and related costs and proceeds from the exercises of employee stock options which were partially offset by the payment of taxes related to the net share settlement of equity awards.

Off-Balance Sheet Arrangements

As of December 31, 2021, we had no off-balance sheet arrangements as defined in Item 303(a)(4) of Regulation S-K as promulgated by the SEC.

Critical Accounting Policies and Estimates

Management’s discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements. The consolidated financial statements have been prepared in conformity with generally accepted accounting principles in the United States and include our accounts and the accounts of our wholly owned subsidiaries. The preparation of our consolidated financial statements requires our management to make estimates, assumptions, and judgments that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the applicable periods. Management bases its estimates, assumptions and judgments on historical experience and on various other factors that are believed to be reasonable under the circumstances. Different assumptions and judgments would change the estimates used in the preparation of our consolidated financial statements, which, in turn, could change the results from those reported. Our management evaluates its estimates, assumptions and judgments on an ongoing basis.

The critical accounting policies requiring estimates, assumptions, and judgments that we believe have the most significant impact on our consolidated financial statements are described below.

Revenue Recognition

Our revenues are derived primarily from product revenue and collaborative research and development agreements. The majority of our contracts with customers typically contain multiple products and services. We account for individual products and services separately if they are distinct-that is, if a product or service is separately identifiable from other items in the contract and if a customer can benefit from it on its own or with other resources that are readily available to the customer.

In determining the appropriate amount of revenue to be recognized as we fulfill our obligations under our product revenue and collaborative research and development agreements, we perform the following steps: (i) identification of the promised goods or services in the contract; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the

constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation.

The majority of our collaborative contracts contain multiple revenue streams such as upfront and/or annual license fees, research and development services, contingent milestone payments upon achievement of contractual criteria, and royalty fees based on the licensees' product revenue or usage, among others. We determine the stand-alone selling price ("SSP") and allocate consideration to distinct performance obligations. Typically, we base our SSPs on our historical sales. If an SSP is not directly observable, then we estimate the SSP taking into consideration market conditions, forecasted sales, entity-specific factors and available information about the customer. We estimate the SSP for license rights by using a discounted cash flow method which includes the following key assumptions: the development timelines, revenue forecasts, commercialization expenses, discount rate, and the probability of technical and regulatory success. For licenses that have been previously sold to other customers, we use historical information to determine SSP.

We account for a contract with a customer when there is approval and commitment from both parties, the rights of the parties are identified, payment terms are identified, the contract has commercial substance and collectability of consideration is probable. Non-cancellable purchase orders received from customers to deliver a specific quantity of product, when combined with our order confirmation, in exchange for future consideration, create enforceable rights and obligations on both parties and constitute a contract with a customer.

We measure revenue based on the consideration specified in the contract with each customer, net of any sales incentives and taxes collected on behalf of government authorities. We recognize revenue in a manner that best depicts the transfer of promised goods or services to the customer, when control of the product or service is transferred to a customer. We make significant judgments when determining the appropriate timing of revenue recognition.

The following is a description of principal activities from which we generate revenue:

Product Revenue

Product revenue consist of sales of biocatalysts, pharmaceutical intermediates and Codex® biocatalyst panels and kits. A majority of our product revenue is made pursuant to purchase orders or supply agreements and is recognized either at a point in time when the control of the product has been transferred to the customer typically upon shipment or over time as the product is manufactured because we have a right to payment from the customer under a binding, non-cancellable purchase order, and there is no alternate use of the product for us as it is specifically made for the customer's use.

Certain of our agreements provide options to customers which they can exercise at a future date, such as the option to purchase our product during the contract duration at discounted prices and an option to extend their contract, among others. In accounting for customer options, we determine whether an option is a material right and this requires us to exercise significant judgment. If a contract provides the customer an option to acquire additional goods or services at a discount that exceeds the range of discounts that we typically give for that product or service, or if the option provides the customer certain additional goods or services for free, the option may be considered a material right. If the contract gives the customer the option to acquire additional goods or services at their normal SSPs, we would likely determine that the option is not a material right and, therefore, account for it as a separate performance obligation when the customer exercises the option. We primarily account for options which provide material rights using the alternative approach available under ASC 606, as we concluded we meet the criteria for using the alternative approach. Therefore, the transaction price is calculated as the expected consideration to be received for all the goods and services we expect to provide. We update the transaction price for expected consideration, subject to constraint, each reporting period if our estimate of future goods to be ordered by customers change.

Research and Development Revenues

We perform research and development activities as specified in each respective customer agreement. We identify each performance obligation in our research and development agreements at contract inception. We allocate the consideration to each distinct performance obligation based on the estimated SSP of each performance obligation. Performance obligations included in our research and services agreements typically include research and development services for a specified term, periodic reports and small samples of enzyme produced.

The majority of our research and development agreements are based on a contractual rate per dedicated project team working on the project. The underlying product that we develop for customers does not create an asset with an alternative use to us and the customer receives benefits as we perform the work towards completion. Thus, our performance obligations are generally satisfied over time as the service is performed. We utilize an appropriate method of measuring progress towards the completion of our performance obligations to determine the timing of revenue recognition. For each performance obligation that is satisfied over time, we recognize revenue using a single measure of progress, typically based on hours incurred.

Our contracts frequently provide customers with rights to use or access our products or technology, along with other promises or performance obligations. Under ASC 606, we must first determine whether the license is distinct from other promises, such as our promise to perform research and development services. If we determine that the customer cannot benefit from the license without our services, the license will be accounted for as combined with the other performance obligations. If we determine that a license is distinct, we would recognize an allocable portion of the transaction price when the license is transferred to the customer, and the customer can use and benefit from it. We estimate the SSP for license rights by using historical information if licenses have been previously sold to customers and for new licenses, we consider multiple methods, a discounted cash flow method which includes the following key assumptions: the development timelines, revenue forecasts, commercialization expenses, discount rate, and the probability of technical and regulatory success.

At the inception of each arrangement that includes variable consideration such as development milestone payments, we evaluate whether the milestones are considered probable of being reached and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within our control or the licensee, such as regulatory approvals, are not considered probable of being achieved until those approvals are received. The transaction price is then allocated to each performance obligation on a relative stand-alone selling price basis, for which we recognize revenue as or when the performance obligations under the contract are satisfied. At the end of each subsequent reporting period, we re-evaluate the probability of achievement of such development milestones and any related constraint, and if necessary, adjust our estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect license, collaboration and other revenues and earnings in the period of adjustment.

Our CodeEvolver® platform technology transfer collaboration agreements typically include license fees, upfront fees, and variable consideration in the form of milestone payments, and sales or usage-based royalties. We have recognized revenues from our platform technology transfer agreements over time.

We also have an agreement under which we have granted a functional license to some elements of our biocatalyst technology. We will recognize revenues for the functional license at a point in time when the control of the license transfers to the customer.

For license agreements that include sales or usage-based royalty payments to us for which the license is the predominant item to which the royalty relates, we do not recognize revenue until the underlying sales of the product or usage has occurred. At the end of each reporting period, we estimate the royalty amount. We recognize revenue at the later of (i) when the related sale of the product occurs, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied, or partially satisfied.

Stock-Based Compensation

We use the Black-Scholes-Merton option pricing model to estimate the fair value of options granted under our equity incentive plans. The Black-Scholes-Merton option pricing model requires the use of assumptions, including the expected term of the award and the expected stock price volatility. The expected term is based on historical exercise behavior on similar awards, giving consideration to the contractual terms, vesting schedules and expectations of future employee behavior. We use historical volatility to estimate expected stock price volatility. The risk-free rate assumption is based on United States Treasury instruments whose terms are consistent with the expected term of the stock options. The expected dividend assumption is based on our history and expectation of dividend payouts.

Restricted Stock Units ("RSUs"), Restricted Stock Awards ("RSAs") and performance-contingent restricted stock units ("PSUs") are measured based on the fair market values of the underlying stock on the dates of grant. Performance based options ("PBOs") are measured using Black-Scholes-Merton option pricing model. The vesting of PBOs and PSUs awarded is conditioned upon the attainment of one or more performance objectives over a specified period and upon continued employment through the applicable vesting date. At the end of the performance period, shares of stock subject to the PBOs and PSUs vest based upon both the level of achievement of performance objectives within the performance period and continued employment through the applicable vesting date.

Stock-based compensation expense is calculated based on awards ultimately expected to vest and is reduced for estimated forfeitures at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The estimated annual forfeiture rates for stock options, RSUs, PSUs, PBOs, and RSAs are based on historical forfeiture experience.

The estimated fair value of stock options, RSUs and RSAs are expensed on a straight-line basis over the vesting term of the grant and the estimated fair value of PSUs and PBOs are expensed using an accelerated method over the term of the award once management has determined that it is probable that the performance objective will be achieved. Compensation expense is

recorded over the requisite service period based on management's best estimate as to whether it is probable that the shares awarded are expected to vest. Management assesses the probability of the performance milestones being met on a continuous basis.

Lease Accounting

We determine if an arrangement is a lease at inception. Where an arrangement is a lease we determine if it is an operating lease or a finance lease. At lease commencement, we record a lease liability and corresponding ROU asset. Lease liabilities represent the present value of our future lease payments over the expected lease term which includes options to extend or terminate the lease when it is reasonably certain those options will be exercised. The present value of our lease liability is determined using our incremental collateralized borrowing rate at lease inception. ROU assets represent our right to control the use of the leased asset during the lease and are recognized in an amount equal to the lease liability for leases with an initial term greater than 12 months. Over the lease term we use the effective interest rate method to account for the lease liability as lease payments are made and the ROU asset is amortized to consolidated statement of operations in a manner that results in straight-line expense recognition.

We elected to apply the practical expedient for short-term leases and accordingly do not apply lease recognition requirements for short-term leases. Instead, we recognize payments related to these arrangements in the consolidated statement of operations as lease costs on a straight-line basis over the lease term.

Investment in Non-Marketable Securities

Investment in Non-Marketable Equity Securities

We measure investments in non-marketable equity securities without a readily determinable fair value using a measurement alternative that measures these securities at the cost method minus impairment, if any, plus or minus changes resulting from observable price changes on a non-recurring basis. Gains and losses on these securities are recognized in other income (expense), net.

Investment in Non-Marketable Debt Securities

We measure available for sale investments in non-marketable debt at fair value. Unrealized gains and losses on these securities are recognized in other comprehensive income until realized. Non-marketable debt securities are classified as available-for-sale securities.

We classify non-marketable debt securities as Level 3 in the fair value hierarchy because we estimate the fair value based on a qualitative analysis using the most recent observable transaction price and other significant unobservable inputs including volatility, rights, and obligations of the securities we hold. Significant changes to the unobservable inputs may result in a significantly higher or lower fair value estimate. We may value these securities based on significant recent arms-length transactions with sophisticated non-strategic unrelated new investors.

We evaluate both equity and debt securities for impairment when circumstances indicate that we may not be able to recover the carrying value. We may impair these securities and establish an allowance for a credit loss when we determine that there has been an “other-than-temporary” decline in estimated fair value of the debt or equity security compared to its carrying value. We calculate the estimated fair value of these securities using information from the investee, which may include:

- Audited and unaudited financial statements;
- Projected technological developments of the company;
- Projected ability of the company to service its debt obligations;
- If a deemed liquidation event were to occur;
- Current fundraising transactions;
- Current ability of the company to raise additional financing if needed;
- Changes in the economic environment which may have a material impact on the operating results of the company;
- Contractual rights, obligations or restrictions associated with the investment; and
- Other factors deemed relevant by our management to assess valuation.

- The valuation may be reduced if the company's potential has deteriorated significantly. If the factors that led to a reduction in valuation are overcome, the valuation may be readjusted.

Recent Accounting Pronouncements

See Note 2, “Basis of Presentation and Summary of Significant Accounting Policies” in the Notes to the Consolidated Financial Statements set forth in Item 8 of this Annual Report on Form 10-K for a full description of recent accounting standards, including the respective dates of adoption and effects on our consolidated financial position, results of operations and cash flows.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Interest Rate Sensitivity

Our unrestricted cash and cash equivalents total $116.8 million at December 31, 2021. We primarily invest these amounts in money market funds which are held for working capital purposes. We do not enter into investments for trading or speculative purposes. As of December 31, 2021, the effect of a hypothetical 10% decrease in market interest rates would have an immaterial impact on a potential loss in future interest income and cash flows.

In June 2017, we entered into a Credit Facility with Western Alliance Bank consisting of term loans up to $10.0 million, and advances under a revolving line of credit up to $5.0 million. Term loans made under the Term Debt bear interest at variable rate through maturity at the greater of (i) 3.75% or (ii) the sum of (A) Index Rate (prime rate published in the Money Rates section of the Western Edition of The Wall Street Journal plus (B) 0.50%. Advances made under the Revolving Line of Credit bear interest at a variable annual rate equal to the greater of (i) 4.25% or (ii) the sum of (A) the prime rate plus (B) 1.00%. Increases in these variable interest rates will increase our future interest expense and decrease our results of operations and cash flows. Our right to take draws on the long term debt expired on December 31, 2021 and no amounts were drawn under the Credit Facility as of December 31, 2021. Our exposure to interest rates risk relates to our 2017 Credit Facility with variable interest rates, where an increase in interest rates may result in higher borrowing costs. Since we have no outstanding borrowings under our 2017 Credit Facility as of December 31, 2021, the effect of a hypothetical 10% change in interest rates would not have any impact on our interest expense.

Foreign Currency Risk

Our results of operations and cash flows are subject to fluctuations due to changes in foreign currency exchange rates. In periods when the USD declines in value as compared to the foreign currencies in which we incur expenses, our foreign-currency based expenses increase when translated into United States dollars. Although substantially all of our sales are denominated in United States dollars, future fluctuations in the value of the USD may affect the price competitiveness of our products outside the United States. Our most significant foreign currency exposure is due to non-functional currency denominated monetary assets, primarily currencies denominated in other than their functional currency. These non-functional currency denominated monetary assets are subject to re-measurement which may create fluctuations in other expense, net, a component in our consolidated statement of operations and in the fair value of the assets in the consolidated balance sheets. As of December 31, 2021, the effect of a hypothetical 10% unfavorable change in exchange rates on currencies denominated in other than their functional currency would result in a potential loss in future earnings in our consolidated statement of operations and a reduction in the fair value of the assets of approximately $46 thousand. We did not engage in hedging transactions in 2021, 2020 and 2019.

Investment in Non-Marketable Equity Securities

We own investments in non-marketable equity securities without readily determinable fair values. We may value these equity securities based on significant recent arms-length equity transactions with sophisticated non-strategic unrelated investors, providing the terms of these security transactions are substantially similar to the security transactions terms between the investors and us. The impact of the difference in transaction terms on the market value of the portfolio company may be difficult or impossible to quantify.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

Codexis, Inc.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

Shareholders and Board of Directors
Codexis, Inc.
Redwood City, California

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Codexis, Inc. (the "Company") as of December 31, 2021 and 2020, the related consolidated statements of operations, stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2021, and the related notes (collectively referred to as the "Consolidated Financial Statements"). In our opinion, the Consolidated Financial Statements present fairly, in all material respects, the financial position of the Company at December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021, in conformity with accounting principles generally accepted in the United States of America.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the Company's internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO") and our report dated February 28, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

These Consolidated Financial Statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's Consolidated Financial Statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) ("PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the Consolidated Financial Statements are free of material misstatement, whether due to error or fraud.

Our audits included performing procedures to assess the risks of material misstatement of the Consolidated Financial Statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the Consolidated Financial Statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the Consolidated Financial Statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current period audit of the Consolidated Financial Statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the Consolidated Financial Statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the Consolidated Financial Statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing separate opinions on the critical audit matter or on the accounts or disclosures to which it relates.

Revenue Recognition

As described in Notes 2 and 3 to the Consolidated Financial Statements, the Company recognizes revenue in a manner that best depicts the transfer of promised goods or services to the customer, when control of the product or service is transferred to a customer. The Company's contracts with customers include enzyme supply, licensing, and collaborative research and development agreements. Contracts with customers may contain multiple performance obligations and may contain up-front or annual license fees, fees for full time employee research and development services, contingent milestone payments upon achievement of contractual criteria, and royalty fees based on the licensees' product revenue or usage. The Company makes significant judgments in determining revenue recognition for customer contracts.

We identified management's significant judgments and estimates related to revenue recognition for contracts with customers as a critical audit matter. Auditing the evaluation of distinct performance obligations, determination and estimation of material

rights, determination of standalone selling prices, determination of the pattern of transfer of control for each distinct performance obligation and estimation of variable consideration required significant audit effort and subjective judgments in evaluating management's estimates.

The primary procedures we performed to address this critical audit matter included:

- Testing the design and operating effectiveness of internal controls relating to the identification of distinct performance obligations and material rights, the determination of the timing of revenue recognition, the estimation of standalone selling prices, and the estimation of variable consideration.

- Examining a sample of revenue contracts and other source documents to test management's identification of significant terms for completeness, including the identification of distinct performance obligations, material rights and variable consideration including sending confirmations to a sample of customers to confirm our understanding of the parties' rights and obligations.

- Assessing the reasonableness of management's estimates and assumptions used in determining stand-alone selling prices for new products and services and those products and services that are not sold separately.

- Evaluating the reasonableness of management's judgments and estimates used to assess the stand-alone selling prices for new functional licenses when granted to customers as part of contracts containing multiple performance obligations.

- Evaluating the reasonableness and accuracy of management's judgments and estimates used in accounting for identified material rights, including transactions accounted for under the alternative approach to estimating the standalone selling price of a material right. This includes testing management's estimates of the expected consideration from the customer's exercise of options.

- Assessing the reasonableness of management's judgments and estimates to calculate variable consideration, and the timing of recognizing the related revenue subject to any constraints.

- Evaluating the appropriateness of management's determination of whether identified performance obligations meet the criteria for over-time revenue recognition, including whether certain products and services have alternative use.

/s/ BDO USA, LLP

We have served as the Company's auditor since 2013.

San Jose, California

February 28, 2022

Report of Independent Registered Public Accounting Firm

Shareholders and Board of Directors
Codexis, Inc.
Redwood City, California

Opinion on Internal Control over Financial Reporting

We have audited Codexis, Inc.'s (the "Company's") internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (the "COSO criteria"). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated balance sheets of the Company as of December 31, 2021 and 2020, the related consolidated statements of operations, stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2021, and the related notes, and our report dated February 28, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying "Item 9A, Management's Report on Internal Control over Financial Reporting". Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit of internal control over financial reporting in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ BDO USA, LLP

San Jose, California

February 28, 2022

Codexis, Inc.
Consolidated Balance Sheets
(In Thousands, Except Per Share Amounts)

	December 31,	
	2021	**2020**
Assets		
Current assets:		
Cash and cash equivalents	$ 116,797	$ 149,117
Restricted cash, current	579	638
Investment in non-marketable debt security	—	1,000
Financial assets:		
Accounts receivable	24,953	13,894
Contract assets ($0 and $450 from a related party)	4,557	4,526
Unbilled receivables	8,558	10,942
Total financial assets	38,068	29,362
Less: allowances	(416)	(74)
Total financial assets, net	37,652	29,288
Inventories	1,160	964
Prepaid expenses and other current assets	5,700	3,416
Total current assets	161,888	184,423
Restricted cash	1,519	1,062
Investment in non-marketable equity securities ($12,713 and $1,450 with a related party)	14,002	1,450
Right-of-use assets - Operating leases, net	44,095	21,382
Right-of-use assets - Finance leases, net	17	119
Property and equipment, net	21,345	9,675
Goodwill	3,241	3,241
Other non-current assets	276	294
Total assets	$ 246,383	$ 221,646
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 2,995	$ 2,970
Accrued compensation	11,119	7,288
Other accrued liabilities	12,578	10,272
Current portion of lease obligations - Operating leases	4,093	2,627
Deferred revenue ($245 and $0 to a related party)	2,586	1,824
Total current liabilities	33,371	24,981
Deferred revenue, net of current portion	3,749	2,967
Long-term lease obligations, Operating leases	43,561	22,324
Other long-term liabilities	1,311	1,271
Total liabilities	81,992	51,543
Commitments and contingencies (Note 13)		
Stockholders' equity:		
Preferred stock, $0.0001 par value per share; 5,000 shares authorized, none issued and outstanding	—	—
Common stock, $0.0001 par value per share; 100,000 shares authorized; 65,109 and 64,283 shares issued and outstanding at December 31, 2021 and December 31, 2020, respectively	6	6
Additional paid-in capital	552,083	536,516
Accumulated deficit	(387,698)	(366,419)
Total stockholders' equity	164,391	170,103
Total liabilities and stockholders' equity	$ 246,383	$ 221,646

See accompanying notes to consolidated financial statements

Codexis, Inc.

Consolidated Statements of Operations
(In Thousands, Except Per Share Amounts)

	Year Ended December 31,		
	2021	**2020**	**2019**
Revenues:			
Product revenue	$ 70,657	$ 30,220	$ 29,465
Research and development revenue ($1,955, $900 and $0 from a related party)	34,097	38,836	38,993
Total revenues	104,754	69,056	68,458
Costs and operating expenses:			
Cost of product revenue	22,209	13,742	15,632
Research and development	55,919	44,185	33,873
Selling, general and administrative	49,323	35,049	31,502
Total costs and operating expenses	127,451	92,976	81,007
Loss from operations	(22,697)	(23,920)	(12,549)
Interest income	459	405	1,287
Other income (expense), net ($983, $0 and $0 from a related party)	1,148	(156)	(656)
Loss before income taxes	(21,090)	(23,671)	(11,918)
Provision for income taxes	189	339	17
Net loss	$ (21,279)	$ (24,010)	$ (11,935)
Net loss per share, basic and diluted	$ (0.33)	$ (0.40)	$ (0.21)
Weighted average common stock shares used in computing net loss per share, basic and diluted	64,568	59,360	56,525

See accompanying notes to consolidated financial statements

Codexis, Inc.

Consolidated Statements of Stockholders' Equity
(In Thousands)

	Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total Stockholders' Equity
	Shares	Amount			
December 31, 2018	54,065	$ 5	$ 386,775	$ (330,474)	$ 56,306
Exercise of stock options	1,466	—	7,099	—	7,099
Release of stock awards	449	—	—	—	—
Employee stock-based compensation	—	—	6,943	—	6,943
Taxes paid related to net share settlement of equity awards	(152)	—	(2,850)	—	(2,850)
Issuance of common stock, net of issuance costs of $123	3,049	1	49,876	—	49,877
Short swing profit settlement	—	—	77	—	77
Net loss	—	—	—	(11,935)	(11,935)
December 31, 2019	58,877	6	447,920	(342,409)	105,517
Exercise of stock options	210	—	1,323	—	1,323
Release of stock awards	370	—	—	—	—
Employee stock-based compensation	—	—	7,622	—	7,622
Non-employee stock-based compensation	—	—	106	—	106
Taxes paid related to net share settlement of equity awards	(103)	—	(1,257)	—	(1,257)
Issuance of common stock, net of issuance costs of $5,448	4,929	—	80,802	—	80,802
Net loss	—	—	—	(24,010)	(24,010)
December 31, 2020	64,283	6	536,516	(366,419)	170,103
Exercise of stock options	699	—	5,180	—	5,180
Release of stock awards	181	—	—	—	—
Employee stock-based compensation	—	—	11,346	—	11,346
Non-employee stock-based compensation	—	—	247	—	247
Taxes paid related to net share settlement of equity awards	(54)	—	(1,206)	—	(1,206)
Net loss	—	—	—	(21,279)	(21,279)
December 31, 2021	65,109	$ 6	$ 552,083	$ (387,698)	$ 164,391

See accompanying notes to consolidated financial statements

Codexis, Inc.
Consolidated Statements of Cash Flows
(In Thousands)

	Year Ended December 31,		
	2021	**2020**	**2019**
Operating activities:			
Net loss	$ (21,279)	$ (24,010)	$ (11,935)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation	3,113	1,950	1,570
Amortization expense - right-of-use assets - operating and finance leases	2,834	2,604	2,987
Stock-based compensation	11,593	7,728	6,943
Allowance for credit losses	342	40	—
Equity securities earned from research and development activities from a related party	(1,955)	(900)	—
Unrealized gain on non-marketable securities (($983) from a related party)	(1,272)	—	—
Other non-cash items	(19)	15	525
Changes in operating assets and liabilities:			
Financial assets ($0, ($450) and ($332) from a related party)	(9,156)	(8,723)	(5,867)
Inventories	(196)	(593)	217
Prepaid expenses and other assets	(2,268)	(1,012)	(1,324)
Accounts payable	268	101	(428)
Accrued compensation and other accrued liabilities	6,575	6,175	2,205
Other long-term liabilities	(4,147)	(2,586)	(1,210)
Deferred revenue ($245, $0 and $0 to a related party)	1,300	2,747	(6,243)
Net cash used in operating activities	(14,267)	(16,464)	(12,560)
Investing activities:			
Purchase of property and equipment	(13,828)	(3,748)	(3,730)
Proceeds from sale of property and equipment	36	—	3
Proceeds from sale of investment securities	—	—	62
Investment in non-marketable securities (($7,630) and ($1,000) in a related party)	(7,630)	(2,000)	—
Net cash used in investing activities	(21,422)	(5,748)	(3,665)
Financing activities:			
Proceeds from exercises of stock options	5,180	1,323	7,099
Proceeds from issuance of common stock in connection with public offering	—	86,250	—
Costs incurred in connection with equity financing	(207)	(5,448)	(123)
Proceeds from issuance of common stock in connection with private offering	—	—	50,000
Payments of lease obligations - Finance leases	—	(60)	(242)
Recovery of short swing profit	—	—	77
Taxes paid related to net share settlement of equity awards	(1,206)	(1,257)	(2,850)
Net cash provided by financing activities	3,767	80,808	53,961
Net increase (decrease) in cash, cash equivalents and restricted cash	(31,922)	58,596	37,736
Cash, cash equivalents and restricted cash at the beginning of the year	150,817	92,221	54,485
Cash, cash equivalents and restricted cash at the end of the year	$ 118,895	$ 150,817	$ 92,221
Supplemental disclosure of cash flow information:			
Interest paid	$ 14	$ 52	$ 49
Income taxes	$ 102	$ 312	$ 5
Supplemental non-cash investing and financing activities:			
Capital expenditures incurred but not yet paid	$ 2,533	$ 1,750	$ 140

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the consolidated balance sheets to the total of the same such amounts shown above (in thousands):

	Year Ended December 31,		
	2021	**2020**	**2019**
Cash and cash equivalents	$ 116,797	$ 149,117	$ 90,498
Restricted cash, current and non-current	2,098	1,700	1,723
Total cash, cash equivalents and restricted cash at the end of the period	$ 118,895	$ 150,817	$ 92,221

See accompanying notes to consolidated financial statements

Codexis, Inc.

Notes to Consolidated Financial Statements

Note 1. Description of Business

In these notes to the Consolidated Financial Statements, the “Company,” “we,” “us,” and “our” refers to Codexis, Inc. and its subsidiaries on a consolidated basis.

We discover, develop and sell enzymes and other proteins that deliver value to our clients in a growing set of industries to commercialize an increasing number of novel enzymes, both as proprietary Codexis products and in partnership with our customers.

We report our financial results based on two reportable segments: Performance Enzymes and Novel Biotherapeutics. The segment information aligns with how the chief operating decision maker (CODM), who is our Chief Executive Officer (CEO), reviews and manages the business.

Business Update Regarding COVID-19

We are subject to risks and uncertainties as a result of the current COVID-19 pandemic. The COVID-19 pandemic has presented a substantial public health and economic challenge around the world and is affecting our employees, communities and business operations, as well as the U.S. economy and other economies worldwide. The full extent to which the COVID-19 pandemic will directly or indirectly impact our business, results of operations and financial condition will depend on future developments that are highly uncertain and may not be accurately predicted, including the duration and severity of the pandemic, the prevalence of more contagious and or virulent variants such as the Delta and Omicron variants, and the extent and severity of the impact on our customers, new information that may emerge concerning COVID-19, the actions taken to contain it or treat its impact and the economic impact on local, regional, national and international markets.

In the United States, the impact of COVID-19, including Orders governing the operation of businesses during the pandemic, caused the temporary closure of our Redwood City, California facilities and disrupted our R&D operations in 2020. R&D operations for several projects were temporarily suspended from mid-March 2020 through the end of April 2020 in accordance with these Orders. In May 2020, we initiated limited R&D operations and resumed manufacturing operations at our Redwood City pilot plant and have ramped up operations such that we are currently utilizing our normal R&D capacity while following county, state and federal COVID-19 guidance for the protection of our employees.

To date, we and our collaboration partners have been able to continue to supply our enzymes to our customers worldwide, however, there can be no guarantee this will continue. Furthermore, our ability to provide future research and development ("R&D") services may continue to be impacted as a result of governmental orders ("Orders") and any disruptions in operations of our customers with whom we collaborate. We believe that these disruptions have had a minimal impact on revenue for the year ended December 31, 2021. The extent to which the pandemic may impact our business operations and operating results will continue to remain highly dependent on future developments, which are uncertain and cannot be predicted with confidence.

Note 2. Basis of Presentation and Summary of Significant Accounting Policies

Basis of Presentation and Principles of Consolidation

The accompanying consolidated financial statements have been prepared in accordance with generally accepted accounting principles in the United States of America ("GAAP") and the applicable rules and regulations of the Securities and Exchange Commission ("SEC") and include the accounts of Codexis, Inc. and its wholly-owned subsidiaries.

Certain prior year amounts have been reclassified in the Consolidated Statements of Cash Flows to conform to the 2021 presentation, however these reclassifications had no effect on the reported results of operations.

The consolidated financial statements include the accounts of Codexis, Inc. and its wholly owned subsidiaries. All intercompany balances and transactions have been eliminated in consolidation.

Use of Estimates

The preparation of our consolidated financial statements in conformity with GAAP requires us to make estimates, judgments and assumptions that may affect the reported amounts of assets, liabilities, equity, revenues and expenses and related disclosure of contingent assets and liabilities. We regularly assess these estimates which primarily affect revenue recognition,

inventories, valuation of equity investments, goodwill arising out of business acquisitions, accrued liabilities, stock awards, and the valuation allowances associated with deferred tax assets. Actual results could differ from those estimates and such differences may be material to the consolidated financial statements.

Segment Reporting

We report two business segments, Performance Enzymes and Novel Biotherapeutics, which are based on our operating segments. Operating segments are defined as components of an enterprise about which separate financial information is available that is evaluated regularly by the chief operating decision maker or decision making group ("CODM"), in deciding how to allocate resources, and in assessing performance. Our CODM is our Chief Executive Officer. Our business segments are primarily based on our organizational structure and our operating results as used by our CODM in assessing performance and allocating resources for the Company. We do not allocate or evaluate assets by segment.

The Novel Biotherapeutics segment focuses on new opportunities in the pharmaceutical industry to discover or improve novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability, or immunogenicity. The Performance Enzymes segment consists of biocatalyst products and services with focus on pharmaceutical, food, molecular diagnostics, and other industrial markets.

Foreign Currency Translation

The USD is the functional currency for our operations outside the United States. Accordingly, non-monetary assets and liabilities originally acquired or assumed in other currencies are recorded in USD at the exchange rates in effect at the date they were acquired or assumed. Monetary assets and liabilities denominated in other currencies are translated into United States dollars at the exchange rates in effect at the balance sheet date. Translation adjustments are recorded in other expense in the consolidated statements of operations. Gains and losses realized from non-USD transactions, including intercompany balances not considered as permanent investments, denominated in currencies other than an entity's functional currency are included in other expense in the accompanying consolidated statements of operations.

Revenue Recognition

Our revenues are derived primarily from product revenue and collaborative research and development agreements. The majority of our contracts with customers typically contain multiple products and services. We account for individual products and services separately if they are distinct-that is, if a product or service is separately identifiable from other items in the contract and if a customer can benefit from it on its own or with other resources that are readily available to the customer.

In determining the appropriate amount of revenue to be recognized as we fulfill our obligations under our product revenue and collaborative research and development agreements, we perform the following steps: (i) identification of the promised goods or services in the contract; (ii) determination of whether the promised goods or services are performance obligations, including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation.

The majority of our collaborative contracts contain multiple revenue streams such as upfront and/or annual license fees, fees for research and development services, contingent milestone payments upon achievement of contractual criteria, and royalty fees based on the licensees' product revenue or usage, among others. We determine the stand-alone selling price ("SSP") and allocate consideration to distinct performance obligations. Typically, we base our SSPs on our historical sales. If an SSP is not directly observable, then we estimate the SSP taking into consideration market conditions, forecasted sales, entity-specific factors and available information about the customer. We estimate the SSP for license rights by using historical information if licenses have been previously sold to customers and for new licenses, we consider multiple methods, including a discounted cash flow method which includes the following key assumptions: the development timelines, revenue forecasts, commercialization expenses, discount rate, and the probability of technical and regulatory success.

We account for a contract with a customer when there is approval and commitment from both parties, the rights of the parties are identified, payment terms are identified, the contract has commercial substance and collectability of consideration is probable. Non-cancellable purchase orders received from customers to deliver a specific quantity of product, when combined with our order confirmation, in exchange for future consideration, create enforceable rights and obligations on both parties and constitute a contract with a customer.

We measure revenue based on the consideration specified in the contract with each customer, net of any sales incentives and taxes collected on behalf of government authorities. We recognize revenue in a manner that best depicts the transfer of promised goods or services to the customer, when control of the product or service is transferred to a customer. We make significant judgments when determining the appropriate timing of revenue recognition.

The following is a description of principal activities from which we generate revenue:

Product Revenue

Product revenue consist of sales of biocatalysts, pharmaceutical intermediates and Codex® biocatalyst panels and kits. A majority of our product revenue is made pursuant to purchase orders or supply agreements and is recognized either at a point in time when the control of the product has been transferred to the customer typically upon shipment or over time as the product is manufactured because we have a right to payment from the customer under a binding, non-cancellable purchase order, and there is no alternate use of the product for us as it is specifically made for the customer's use.

Certain of our agreements provide options to customers which they can exercise at a future date, such as the option to purchase our product during the contract duration at discounted prices and an option to extend their contract, among others. In accounting for customer options, we determine whether an option is a material right and this requires us to exercise significant judgment. If a contract provides the customer an option to acquire additional goods or services at a discount that exceeds the range of discounts that we typically give for that product or service for the same class of customer, or if the option provides the customer certain additional goods or services for free, the option may be considered a material right. If the contract gives the customer the option to acquire additional goods or services at their normal SSPs, we would likely determine that the option is not a material right and, therefore, account for it as a separate performance obligation when the customer exercises the option. We primarily account for options which provide material rights using the alternative approach available pursuant to the applicable accounting guidance, as we concluded we meet the criteria for using the alternative approach. Therefore, the transaction price is calculated as the expected consideration to be received for all the goods and services we expect to provide under the contract. We update the transaction price for expected consideration, subject to constraint, each reporting period if our estimates of future goods to be ordered by customers change.

Research and Development Revenues

We perform research and development activities as specified in each respective customer agreement. We identify each performance obligation in our research and development agreements at contract inception. We allocate the consideration to each distinct performance obligation based on the estimated SSP of each performance obligation. Performance obligations included in our research and services agreements typically include research and development services for a specified term, periodic reports and small samples of enzyme produced.

The majority of our research and development agreements are based on a contractual rate per dedicated project team working on the project. The underlying product that we develop for customers does not create an asset with an alternative use to us and the customer receives benefits as we perform the work towards completion. Thus, our performance obligations are generally satisfied over time as the service is performed. We utilize an appropriate method of measuring progress towards the completion of our performance obligations to determine the timing of revenue recognition. For each performance obligation that is satisfied over time, we recognize revenue using a single measure of progress, typically based on hours incurred.

Our contracts frequently provide customers with rights to use or access our products or technology, along with other promises or performance obligations. We must first determine whether the license is distinct from other promises, such as our promise to manufacture a product. If we determine that the customer cannot benefit from the license without our manufacturing capability, the license will be accounted for as combined with the other performance obligations. If we determine that a license is distinct and has significant standalone functionality, we would recognize revenues from a functional license at a point in time when the license is transferred to the customer, and the customer can use and benefit from it. We estimate the SSP for license rights by using historical information if licenses have been previously sold to customers and for new licenses, we consider multiple methods, including a discounted cash flow method which includes the following key assumptions: the development timelines, revenue forecasts, commercialization expenses, discount rate, and the probability of technical and regulatory success. For licenses that have been previously sold to other customers, we use historical information to determine SSP.

At the inception of each arrangement that includes variable consideration such as development milestone payments, we evaluate whether the milestones are considered probable of being reached and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within our control or the licensee, such as regulatory approvals, are not considered probable of being achieved until those approvals are received. The transaction price is then allocated to each performance obligation on a relative stand-alone selling price basis, for which we

recognize revenue as or when the performance obligations under the contract are satisfied. At the end of each subsequent reporting period, we re-evaluate the probability of achievement of such development milestones and any related constraint, and if necessary, adjust our estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect license, collaboration and other revenues and earnings in the period of adjustment.

Our CodeEvolver® platform technology transfer collaboration agreements typically include license fees, upfront fees, and variable consideration in the form of milestone payments, and sales or usage-based royalties. We have recognized revenues from our platform technology transfer agreements over time as our customer learns to use our technology.

For license agreements that include sales or usage-based royalty payments to us, we do not recognize revenue until the underlying sales of the product or usage has occurred. At the end of each reporting period, we estimate the royalty amount. We recognize revenue at the later of (i) when the related sale of the product occurs, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied, or partially satisfied.

Practical Expedients, Elections, and Exemptions

We apply certain practical expedients available which permit us not to adjust the amount of consideration for the effects of a significant financing component if, at contract inception, the expected period between the transfer of promised goods or services and customer payment is one year or less.

We perform monthly services under our research and development agreements, and we use a practical expedient permitting us to recognize revenue at the same time that we have the right to invoice our customer for monthly services completed to date.

We have elected to treat shipping and handling activities as fulfillment costs.

We have elected to record revenue net of sales and other similar taxes.

Contract Assets

Contract assets include amounts related to our contractual right to consideration for completed performance obligations not yet invoiced. Contract assets are reclassified to receivables when the rights become unconditional.

Contract Liabilities

Contract liabilities are recorded as deferred revenues and include payments received in advance of performance under the contract. Contract liabilities are realized when the development services are provided to the customer or control of the products has been transferred to the customer. A portion of our contract liabilities relate to supply arrangements that contain material rights that are recognized using the alternative method, under which the aggregate amount invoiced to the customer for shipped products, including contractual fees, is higher than the amount of revenue recognized based on the transaction price allocated to the shipped products.

Contract Costs

We recognize a non-current asset for the incremental costs of obtaining a contract with a customer if the entity expects to recover such costs. Incremental costs are costs that would not have been incurred if the contract had not been obtained. Examples of contract costs are commissions paid to sales personnel. We do not typically incur significant incremental costs because the compensation of our salespeople is not based on contracts closed but on a mixture of company goals, individual goals, and sales goals. If a commission paid is directly related to obtaining a specific contract, our policy is to capitalize and amortize such costs on a systematic basis, consistent with the pattern of transfer of the good or service to which the asset relates. Contract costs are reported in other non-current assets.

Cost of Product Revenue

Cost of product revenue comprises both internal and third party fixed and variable costs including materials and supplies, labor, facilities, and other overhead costs associated with our product sales. Shipping costs are included in our cost of product revenue. Such charges were not significant in any of the periods presented.

Fulfillment costs, such as shipping and handling, are recognized at a point in time and are included in cost of product sales.

Cost of Research and Development Services

Cost of research and development services related to services under research and development agreements approximate the research funding over the term of the respective agreements and is included in research and development expense. Costs of

services provided under license and platform technology transfer agreements are included in research and development expenses and are expensed in the periods in which such costs are incurred.

Research and Development Expenses

Research and development expenses consist of costs incurred for internal projects and partner-funded collaborative research and development activities, as well as license and platform technology transfer agreements, as mentioned above. These costs include our direct and research-related overhead expenses, which include salaries and other personnel-related expenses (including stock-based compensation), occupancy-related costs, supplies, and depreciation of facilities and laboratory equipment, as well as external costs, and are expensed as incurred. Costs to acquire technologies that are utilized in research and development and that have no alternative future use are expensed when incurred.

Advertising

Advertising costs are expensed as incurred and included in selling, general and administrative expenses in the consolidated statements of operations. Advertising costs were $0.3 million, $0.3 million and $0.5 million in the years ended December 31, 2021, 2020 and 2019, respectively.

Stock-Based Compensation

We use the Black-Scholes-Merton option pricing model to estimate the fair value of options granted under our equity incentive plans. The Black-Scholes-Merton option pricing model requires the use of assumptions, including the expected term of the award and the expected stock price volatility. The expected term is based on historical exercise behavior on similar awards, giving consideration to the contractual terms, vesting schedules and expectations of future employee behavior. We use historical volatility to estimate expected stock price volatility. The risk-free rate assumption is based on United States Treasury instruments whose terms are consistent with the expected term of the stock options. The expected dividend assumption is based on our history and expectation of dividend payouts.

Restricted Stock Units (“RSUs"), Restricted Stock Awards (“RSAs”) and performance-contingent restricted stock units (“PSUs”) are measured based on the fair market values of the underlying stock on the dates of grant. Performance based options (“PBOs”) are measured using Black-Scholes-Merton option pricing model. The vesting of PBOs and PSUs awarded is conditioned upon the attainment of one or more performance objectives over a specified period and upon continued employment through the applicable vesting date. At the end of the performance period, shares of stock subject to the PBOs and PSUs vest based upon both the level of achievement of performance objectives within the performance period and continued employment through the applicable vesting date.

Stock-based compensation expense is calculated based on awards ultimately expected to vest and is reduced for estimated forfeitures at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The estimated annual forfeiture rates for stock options, RSUs, PSUs, PBOs, and RSAs are based on historical forfeiture experience.

The estimated fair value of stock options, RSUs and RSAs are expensed on a straight-line basis over the vesting term of the grant and the estimated fair value of PSUs and PBOs are expensed using an accelerated method over the term of the award once management has determined that it is probable that the performance objective will be achieved. Compensation expense is recorded over the requisite service period based on management's best estimate as to whether it is probable that the shares awarded are expected to vest. Management assesses the probability of the performance milestones being met on a continuous basis.

Cash and Cash Equivalents

We consider all highly liquid investments with maturity dates of three months or less at the date of purchase to be cash equivalents. Cash and cash equivalents consist of cash on deposit with banks and money market funds. The majority of cash and cash equivalents is maintained with major financial institutions in the United States. Deposits with these financial institutions may exceed the amount of insurance provided on such deposits.

Restricted Cash

In 2016, we began the process of liquidating our Indian subsidiary. The local legal requirements for liquidation required us to maintain our subsidiary's cash balance in an account managed by a legal trustee to satisfy our financial obligations. This balance is recorded as current restricted cash on the consolidated balance sheets of $0.6 million as of December 31, 2021 and 2020.

Pursuant to the terms of a lease agreement for our Redwood City, CA facilities, we obtained a letter of credit collateralized by cash deposit balances of $1.1 million as of December 31, 2021 and 2020. Pursuant to the terms of our new lease agreement for our San Carlos, CA facility, we also obtained a letter of credit collateralized by cash deposit balances of $0.5 million as of December 31, 2021. These cash deposits balances are recorded as non-current restricted cash on the consolidated balance sheets. For additional information, see Note 13, “Commitments and Contingencies”.

Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. In determining fair value, we utilize valuation techniques that maximize the use of observable inputs and minimize the use of unobservable inputs to the extent possible and we consider counterparty credit risk in our assessment of fair value. Carrying amounts of financial instruments, including cash equivalents, accounts receivable, accounts payable, and accrued liabilities, approximate their fair values as of the balance sheet dates because of their short maturities.

The fair value hierarchy distinguishes between (1) market participant assumptions developed based on market data obtained from independent sources (observable inputs) and (2) an entity’s own assumptions about market participant assumptions developed based on the best information available in the circumstances (unobservable inputs). The fair value hierarchy consists of three broad levels, giving the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). The three levels of the fair value hierarchy are described below:

- Level 1: Inputs that are unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date.
- Level 2: Inputs that are either directly or indirectly observable for the asset or liability through correlation with market data at the measurement date and for the duration of the instrument’s anticipated life.
- Level 3: Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities and which reflect management’s best estimate of what market participants would use in pricing the asset or liability at the measurement date.

Concentrations of Credit Risk

Financial instruments that potentially subject us to significant concentrations of credit risk consist primarily of cash and cash equivalents, accounts receivable and unbilled receivables, contract assets, non-marketable securities, and restricted cash. Cash that is not required for immediate operating needs is invested principally in money market funds. Cash and cash equivalents are invested through banks and other financial institutions in the United States, India, and the Netherlands. Such deposits in those countries may be in excess of insured limits. The Company has not experienced material losses on its deposits of cash and cash equivalents.

We perform ongoing credit evaluations of our customer's financial condition whenever deemed necessary. We maintain an allowance for doubtful accounts based on the expected collectability of all financial assets, which takes into consideration an analysis of historical bad debts, specific customer creditworthiness and current economic trends. As of December 31, 2021, we had one customer that accounted for 62% of our accounts receivable balance. As of December 31, 2020, three customers accounted for 70% of our accounts receivable balance. We believe the accounts receivable balances from our largest customers do not represent a significant credit risk, based on cash flow forecasts, balance sheet analysis, and past collection experience.

Financial Assets and Allowances

We currently sell enzymes primarily to pharmaceutical and fine chemicals companies throughout the world by the extension of trade credit terms based on an assessment of each customer's financial condition. Trade credit terms are generally offered without collateral and may include an insignificant discount for prompt payment for specific customers. To manage our credit exposure, we perform ongoing evaluations of our customers' financial conditions. In addition, accounts receivable include amounts owed to us under our collaborative research and development agreements.

We recognize accounts receivable at invoiced amounts and we maintain a valuation allowance for credit losses using an impairment model (known as the “current expected credit loss model” or “CECL”) based on estimates and forecasts of future conditions requiring recognition of a lifetime of expected credit losses at inception on our financing receivables measured at amortized costs which consisted of accounts receivable, contract assets, and unbilled receivables. We have determined that our financing receivables share similar risk characteristics including: (i) customer origination in the pharmaceutical and fine chemicals industry, (ii) similar historical credit loss pattern of customers (iii) no meaningful trade receivable differences in terms, (iv) similar historical credit loss experience and (v) our belief that the composition of certain assets are comparable to our

historical portfolio used to develop loss history. As a result, we measured the allowance for credit loss ("ACL") on a collective basis. Our ACL methodology considers how long the asset has been past due, the financial condition of the customers, which includes ongoing quarterly evaluations and assessments of changes in customer credit ratings, and other market data that we believe are relevant to the collectability of the assets. Nearly all financing receivables are due from customers that are highly rated by major rating agencies and have a long history of no credit loss. We derive our ACL by establishing an impairment rate attributable to assets not yet identified as impaired.

We derive our ACL by initially relying on our historical financing receivable loss rate which contemplates the full contractual life of the assets sharing similar risk characteristics, adjusted to reflect (i) the extent to which we have determined current conditions differ from the conditions that existed for the period over which historical loss information was evaluated and (ii) by taking into consideration the changes in certain macroeconomic historical and forecasted information. We apply the ACL to past due financing receivables and record charges to the ACL as a provision to credit loss expense in the Statement of Operations. Financing receivables we identify as uncollectible are also charged against the ACL. We adjust the impairment rate to reflect the extent to which we have determined current conditions differ from the conditions that existed for the period over which historical loss information was evaluated. Adjustments to historical loss information may be qualitative or quantitative in nature and reflect changes related to relevant data.

Unbilled Receivable

The timing of revenue recognition may differ from the timing of invoicing to our customers. When we satisfy (or partially satisfy) a performance obligation, prior to being able to invoice the customer, we recognize an unbilled receivable when the right to consideration is unconditional.

Inventories

Inventories are stated at the lower of cost or net realizable value. Cost is determined using a weighted-average approach, assuming full absorption of direct and indirect manufacturing costs, or based on cost of purchasing from our vendors. If inventory costs exceed expected net realizable value due to obsolescence or lack of demand, valuation adjustments are recorded for the difference between the cost and the expected net realizable value.

Concentrations of Supply Risk

We rely on a limited number of suppliers for our products. We believe that other vendors would be able to provide similar products; however, the qualification of such vendors may require substantial start-up time. In order to mitigate any adverse impacts from a disruption of supply, we attempt to maintain an adequate supply of critical single-sourced materials. For certain materials, our vendors maintain a supply for us. We outsource the large scale manufacturing of our products to contract manufacturers with facilities in Austria and Italy.

Property and Equipment

Property, equipment and leasehold improvements are stated at cost less accumulated depreciation and amortization calculated using the straight-line method over their estimated useful lives as follows:

Asset classification	Estimated useful life
Laboratory equipment	5 years
Computer equipment and software	3 to 5 years
Office equipment and furniture	5 years
Leasehold improvements	Lesser of useful life or lease term

Property and equipment classified as construction in process includes equipment that has been received but not yet placed in service. Normal repairs and maintenance costs are expensed as incurred.

Impairment of Long-Lived Assets

We have not identified property and equipment by segment since these assets are shared or commingled. We evaluate the carrying values of long-lived assets, which include property and equipment and right-of-use assets, whenever events, changes in business circumstances or our planned use of long-lived assets indicate that their carrying amounts may not be fully recoverable or that their useful lives are no longer appropriate. If these facts and circumstances exist, we assess for recovery by comparing the carrying values of long-lived assets with their future net undiscounted cash flows. If the comparison indicates that impairment exists, long-lived assets are written down to their respective fair values based on discounted cash flows. Significant

management judgment is required in the forecast of future operating results that are used in the preparation of unexpected undiscounted cash flows.

As of December 31, 2021 and 2020, there were no events or changes in circumstances which indicated that the carrying amount of our asset group might not be recoverable. No impairment charges for long-lived assets were recorded during the years ended December 31, 2021, 2020 and 2019.

Investment in Non-Marketable Securities

Investment in Non-Marketable Equity Securities

We measure investments in non-marketable equity securities without a readily determinable fair value using a measurement alternative that measures these securities at the cost method minus impairment, if any, plus or minus changes resulting from observable price changes on a non-recurring basis. Gains and losses on these securities are recognized in other income (expense), net.

Investment in Non-Marketable Debt Securities

We measure available-for-sale investments in non-marketable debt at fair value. Unrealized gains and losses on these securities are recognized in other comprehensive income until realized. Non-marketable debt securities are classified as available-for-sale securities.

We classify non-marketable debt securities as Level 3 in the fair value hierarchy because we estimate the fair value based on a qualitative analysis using the most recent observable transaction price and other significant unobservable inputs including volatility, rights, and obligations of the securities we hold. Significant changes to the unobservable inputs may result in a significantly higher or lower fair value estimate. We may value these securities based on significant recent arms-length transactions with sophisticated non-strategic unrelated new investors.

We evaluate both equity and debt securities for impairment when circumstances indicate that we may not be able to recover the carrying value. We may impair these securities and establish an allowance for a credit loss when we determine that there has been an “other-than-temporary” decline in estimated fair value of the debt or equity security compared to its carrying value. We calculate the estimated fair value of these securities using information from the investee, which may include:

- Audited and unaudited financial statements;
- Projected technological developments of the company;
- Projected ability of the company to service its debt obligations;
- If a deemed liquidation event were to occur;
- Current fundraising transactions;
- Current ability of the company to raise additional financing if needed;
- Changes in the economic environment which may have a material impact on the operating results of the company;
- Contractual rights, obligations or restrictions associated with the investment; and
- Other factors deemed relevant by our management to assess valuation.
- The valuation may be reduced if the company's potential has deteriorated significantly. If the factors that led to a reduction in valuation are overcome, the valuation may be readjusted.

Goodwill

Goodwill represents the excess of the consideration transferred over the fair value of net assets of businesses acquired and is assigned to reporting units. We test goodwill for impairment considering amongst other things, whether there have been sustained declines in our share price. If we conclude it is more likely than not that the fair value of a reporting unit is less than its carrying amount, a quantitative fair value test is performed. We manage our business as two reporting units and we test goodwill for impairment at the reporting unit level. We allocated goodwill to the two reporting units using a relative fair value allocation methodology that primarily relied on our estimates of revenue and future earnings for each reporting unit. Using the relative fair value allocation methodology, we have determined that approximately $2.4 million, or 76%, of the goodwill is allocated to the Performance Enzymes segment and $0.8 million, or 24%, is assigned to the Novel Biotherapeutics segment.

We test goodwill for impairment annually on a reporting unit basis, on the last day of the fourth fiscal quarter, and between annual tests if events and circumstances indicate it is more likely than not that the fair value of a reporting unit is less than its carrying amount. The annual impairment test is completed using either: a qualitative "Step 0" assessment based on reviewing relevant events and circumstances; or a quantitative "Step 1" assessment, which determines the fair value of the reporting unit. To the extent the carrying amount of a reporting unit is less than its estimated fair value, an impairment charge is recorded. Using the relative fair value allocation methodology for assets and liabilities used in both of our reporting units, we compare the allocated carrying amount of each reporting unit's net assets and the assigned goodwill to its fair value. If the fair value of the reporting unit exceeds its carrying amount, goodwill of the reporting unit is considered not impaired. Any excess of the reporting unit's carrying amount of goodwill over its fair value is recognized as an impairment. During 2021, 2020 and 2019, we did not record impairment charges related to goodwill.

Lease Accounting

We determine if an arrangement is a lease at inception. Where an arrangement is a lease, we determine if it is an operating lease or a finance lease. At lease commencement, we record a lease liability and ROU asset. Lease liabilities represent the present value of our future lease payments over the expected lease term which includes options to extend or terminate the lease when it is reasonably certain those options will be exercised. The present value of our lease liability is determined using our incremental collateralized borrowing rate at lease inception. ROU assets represent our right to control the use of the leased asset during the lease and are recognized in an amount equal to the lease liability for leases with an initial term greater than 12 months. Over the lease term, we use the effective interest rate method to account for the lease liability as lease payments are made and the ROU asset is amortized to the consolidated statement of operations in a manner that results in straight-line expense recognition. We do not apply lease recognition requirements for short-term leases. Instead, we recognize payments related to these arrangements in the consolidated statement of operations as lease costs on a straight-line basis over the lease term.

Income Taxes

We use the liability method of accounting for income taxes, whereby deferred tax asset or liability account balances are calculated at the balance sheet date using current tax laws and rates in effect for the year in which the differences are expected to affect taxable income. Valuation allowances are provided when necessary to reduce deferred tax assets to the amount that will more likely than not be realized.

We make certain estimates and judgments in determining income tax expense for financial statement purposes. These estimates and judgments occur in the calculation of tax credits, benefits and deductions and in the calculation of certain tax assets and liabilities, which arise from differences in the timing of recognition of revenues and expenses for tax and financial statement purposes. Significant changes to these estimates may result in an increase or decrease to our tax provision in a subsequent period.

In assessing the realizability of deferred tax assets, we consider whether it is more likely than not that some portion or all of the deferred tax assets will be realized on a jurisdiction by jurisdiction basis. The ultimate realization of deferred tax assets is dependent upon the generation of taxable income in the future. We have recorded a valuation allowance against these deferred tax assets in jurisdictions where ultimate realization of deferred tax assets is more likely than not to occur. As of December 31, 2021, we maintain a full valuation allowance in all jurisdictions against the net deferred tax assets as we believe that it is more likely than not that the majority of deferred tax assets will not be realized.

We make estimates and judgments about our future taxable income that are based on assumptions that are consistent with our plans and estimates. Should the actual amounts differ from our estimates, the amount of our valuation allowance may be materially impacted. Any adjustment to the deferred tax asset valuation allowance would be recorded in the statements of operations for the periods in which the adjustment is determined to be required.

We account for uncertainty in income taxes as required by the provisions of ASU 2009-06, *Income Taxes (Topic 740) Implementation Guidance on Accounting for Uncertainty in Income Taxes and Disclosure Amendments for Nonpublic Entities*, which clarifies the accounting for uncertainty in income taxes recognized in an enterprise's financial statements. The first step is to evaluate the tax position for recognition by determining if the weight of available evidence indicates that it is more likely than not that the position will be sustained on audit, including resolution of related appeals or litigation processes, if any. The second step is to estimate and measure the tax benefit as the largest amount that is more than 50% likely of being realized upon ultimate settlement. It is inherently difficult and subjective to estimate such amounts, as this requires us to determine the probability of various possible outcomes. We consider many factors when evaluating and estimating our tax positions and tax benefits, which may require periodic adjustments and may not accurately anticipate actual outcomes.

The Tax Reform Act of 1986 and similar state provisions limit the use of net operating loss ("NOL") carryforwards in

certain situations where equity transactions result in a change of ownership as defined by Internal Revenue Code Section 382. In the event we should experience such a change of ownership, utilization of our federal and state NOL carryforwards could be limited.

Accounting Pronouncements

Recently adopted accounting pronouncements

In December 2019, the FASB issued ASU 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes which is intended to simplify various aspects related to accounting for income taxes*. The standard is effective for fiscal years, and interim periods within those years, beginning after December 15, 2020, with early adoption permitted. The standard was adopted beginning January 1, 2021 on a retrospective basis. The adoption of ASU 2019-12 did not have an impact on our consolidated financial statements and related disclosures.

In October 2020, the FASB issued ASU No. 2020-10, *Codification Improvements*. ASU 2020-10 provides amendments to a wide variety of topics in the FASB's Accounting Standards Codification, which applies to all reporting entities within the scope of the affected accounting guidance. We adopted the standard on January 1, 2021 and it had no impact on our consolidated financial statements and related disclosures.

Recently issued accounting pronouncements not yet adopted

From time to time, new accounting pronouncements are issued by the FASB or other standards setting bodies that are adopted by us as of the specified effective date. Unless otherwise discussed, we believe that the impact of recently issued standards that are not yet effective will not have a material impact on our consolidated financial statements upon adoption.

In May 2021, FASB issued ASU No. 2021-04, *Earnings Per Share (Topic 260), Debt—Modifications and Extinguishments (Subtopic 470-50), Compensation—Stock Compensation (Topic 718), and Derivatives and Hedging—Contracts in Entity's Own Equity (Subtopic 815-40), Issuer's Accounting for Certain Modifications or Exchanges of Freestanding Equity-Classified Written Call Options, a consensus of the Emerging Issues Task Force*. The standard establishes a principles-based framework in accounting for modifications of freestanding equity-classified written call options on the basis of the economic substance of the underlying transaction. The standard also requires incremental financial statement disclosures. The standard affects entities that present earnings per share in accordance with the guidance in Topic 260, Earnings Per Share. The standard is effective for fiscal years beginning after December 15, 2021, including interim periods within those fiscal years with early adoption is permitted by applying the standard as of the beginning of the fiscal year that includes that interim period. The standard may be adopted prospectively for modifications or exchanges occurring on or after the effective date. We have evaluated that the adoption of ASU 2021-04 will not have an impact on our consolidated financial statements and related disclosures.

In August 2020, FASB issued ASU No 2020-06 *Debt—Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging— Contracts in Entity's Own Equity (Subtopic 815-40) No. 2020-06 August 2020 Accounting for Convertible Instruments and Contracts in an Entity's Own Equity*, to reduce the complexity and to simplify the accounting for convertible debt instruments and convertible preferred stock, and the derivatives scope exception for contracts in an entity's own equity. In addition, the guidance on calculating diluted earnings per share has been simplified and made more internally consistent. The standard is effective the for fiscal years beginning after December 15, 2021, and interim periods within those fiscal years, with early adoption permitted for fiscal periods beginning after December 15, 2020. The standard may be adopted on a modified retrospective or fully retrospective method of transition and on adoption, entities may irrevocably elect the fair value option in accordance with Subtopic 825-10, Financial Instruments—Overall, for any financial instrument that is a convertible security. We have evaluated that the adoption of ASU 2020-06 will not have an impact on our consolidated financial statements and related disclosures.

In March 2020, the FASB issued ASU 2020-04, Reference Rate Reform (Topic 848)*: Facilitation of the Effects of Reference Rate Reform on Financial Reporting*. The standard provides optional expedients and exceptions for applying GAAP to contracts, hedging relationships, and other transactions in which the reference LIBOR or another reference rate are expected to be discontinued as a result of the Reference Rate Reform. The standard is effective for all entities. The standard may be adopted as of any date from the beginning of an interim period that includes or is subsequent to March 12, 2020 through December 31, 2022, on a prospective basis. We will evaluate transactions or contract modifications occurring as a result of reference rate reform and determine whether to elect the optional expedients for contract modification; however, we believe that the adoption of ASU 2020-04 will have no significant impact on our consolidated financial statements and related disclosures.

Note 3. Revenue Recognition

Disaggregation of Revenue

The following table provides information about disaggregated revenue from contracts with customers into the nature of the products and services, and geographic regions, and includes a reconciliation of the disaggregated revenue for reportable segments. The geographic regions that are tracked are the Americas (United States, Canada, and Latin America), EMEA (Europe, Middle East, and Africa), and APAC (Australia, New Zealand, Southeast Asia, and China).

Segment information for each of the fiscal years are as follows (in thousands):

	Year Ended December 31, 2021		
	Performance Enzymes	Novel Biotherapeutics	Total
Major products and service:			
Product revenue	$ 70,657	$ —	$ 70,657
Research and development revenue	19,858	14,239	34,097
Total revenues	$ 90,515	$ 14,239	$ 104,754
Primary geographical markets:			
Americas	$ 16,114	$ 7,367	$ 23,481
EMEA	13,315	6,872	20,187
APAC	61,086	—	61,086
Total revenues	$ 90,515	$ 14,239	$ 104,754

	Year Ended December 31, 2020		
	Performance Enzymes	Novel Biotherapeutics	Total
Major products and service:			
Product revenue	$ 30,220	$ —	$ 30,220
Research and development revenue	17,886	20,950	38,836
Total revenues	$ 48,106	$ 20,950	$ 69,056
Primary geographical markets:			
Americas	$ 11,111	$ 13,241	$ 24,352
EMEA	11,548	7,709	19,257
APAC	25,447	—	25,447
Total revenues	$ 48,106	$ 20,950	$ 69,056

	Year Ended December 31, 2019		
	Performance Enzymes	Novel Biotherapeutics	Total
Major products and service:			
Product revenue	$ 29,465	$ —	$ 29,465
Research and development revenue	28,691	10,302	38,993
Total revenues	$ 58,156	$ 10,302	$ 68,458
Primary geographical markets:			
Americas	$ 13,039	$ —	$ 13,039
EMEA	26,831	10,302	37,133
APAC	18,286	—	18,286
Total revenues	$ 58,156	$ 10,302	$ 68,458

Contract Balances

The following table presents balances of contract assets, unbilled receivables, contract costs, and contract liabilities (in thousands):

	December 31, 2021	December 31, 2020
Contract assets	$ 4,557	$ 4,526
Unbilled receivables	$ 8,558	$ 10,942
Contract costs	$ 56	$ 90
Contract liabilities: deferred revenue	$ 6,335	$ 4,791

We recognize accounts receivable when we have an unconditional right to recognize revenue and have issued an invoice to the customer. Our payment terms are generally between 30 and 90 days. We recognize unbilled receivables when we have an unconditional right to recognize revenue and have not issued an invoice to our customer. Unbilled receivables are transferred to accounts receivable on issuance of an invoice. Unbilled receivables are classified separately on the consolidated balance sheets as assets. We maintain a valuation allowance on accounts receivables and unbilled receivables.

Contract assets represent our right to recognize revenue for custom products with no alternate use and under binding non-cancellable contracts and are largely related to our procurement of product. We recognize contract assets when we have a conditional right to recognize revenue. The transfer of control of certain of products occurs in advance of the invoicing process, which generates contract assets. In addition, we recognize a contract asset related to milestones not eligible for royalty accounting when we assess it is probable of being achieved and there will be no significant reversal of cumulative revenues. Contract assets are classified separately on the consolidated balance sheets as an asset and transferred to accounts receivables when our rights to payment become unconditional.

Contract liabilities, or deferred revenue, represent our obligation to transfer a product or service to the customer, and for which we have received consideration from the customer. We recognize a contract liability when we receive advance customer payments under development agreements for research and development services, upfront license payments, and from upfront customer payments received under product supply agreements. Contract liabilities are classified as a liability on the consolidated balance sheet.

Contract costs relate to incremental costs of obtaining a contract with a customer. Contract costs are amortized along with the associated revenue over the term of the contract.

During the years ended December 31, 2021, 2020 and 2019, we had no asset impairment charges related to contract assets.

We recognized the following revenues (in thousands):

	Year Ended December 31,	
Revenue recognized in the period for:	**2021**	**2020**
Amounts included in contract liabilities at the beginning of the period:		
Performance obligations satisfied	$ 1,858	$ 57
Changes in the period:		
Changes in the estimated transaction price allocated to performance obligations satisfied in prior periods	7,645	774
Performance obligations satisfied from new activities in the period - contract revenue	95,251	68,225
Total revenues	$ 104,754	$ 69,056

Performance Obligations

The following table includes estimated revenue expected to be recognized in the future related to performance obligations that are unsatisfied or partially unsatisfied at the end of the reporting periods. The estimated revenue does not include contracts

with original durations of one year or less, amounts of variable consideration attributable to royalties, or contract renewals that are unexercised as of December 31, 2021.

The balances in the table below are partially based on judgments involved in estimating future orders from customers subject to the exercise of material rights pursuant to respective contracts (in thousands):

	2022	2023	2024	2025 and Thereafter	Total
Product revenue	$ 89	$ 87	$ 120	$ 2,985	$ 3,281
Research and development revenue	2,497	557	—	—	3,054
Total revenues	$ 2,586	$ 644	$ 120	$ 2,985	$ 6,335

Note 4. Net Loss per Share

Basic net loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock outstanding, less restricted stock awards ("RSAs") subject to forfeiture. Diluted net loss per share is computed by dividing net loss by the weighted-average number of shares of common stock shares outstanding, less RSAs subject to forfeiture, plus all additional common shares that would have been outstanding, assuming dilutive potential common stock shares had been issued for other dilutive securities. For all periods presented, diluted and basic net loss per share are identical since potential common stock shares are excluded from the calculation, as their effect was anti-dilutive.

Anti-Dilutive Securities

In periods of net loss, the weighted average number of shares outstanding, prior to the application of the treasury stock method, excludes potentially dilutive securities from the computation of diluted net loss per common share because including such shares would have an anti-dilutive effect.

The following shares were not considered in the computation of diluted net loss per share because their effect was anti-dilutive (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Shares issuable under the Equity Incentive Plan	5,215	5,348	4,763

Note 5. Collaborative Arrangements

GSK Platform Technology Transfer, Collaboration and License Agreement

In July 2014, we entered into a CodeEvolver® protein engineering platform technology transfer collaboration and license agreement (the "GSK CodeEvolver® Agreement") with GSK. Pursuant to the terms of the agreement, we granted GSK a non-exclusive license to use the CodeEvolver® protein engineering platform technology to develop novel enzymes for use in the manufacture of GSK's pharmaceutical and health care products. We completed the transfer of the CodeEvolver® protein engineering platform technology to GSK in April 2016 and all revenues relating to the technology transfer have been recognized as of April 2016. Depending upon GSK's successful application of the licensed technology, we have the potential to receive additional contingent payments that range from $5.75 million to $38.5 million per project.

In 2019, we received a $2.0 million milestone payment relating to the advancement of an enzyme developed by GSK using our CodeEvolver® protein engineering platform technology. In 2021, we received two additional milestone payments from GSK under the agreement. We recognized research and development revenue of $4.3 million, nil, and $2.0 million in the years ended December 31, 2021, 2020, and 2019, respectively.

Merck Platform Technology Transfer and License Agreement

In August 2015, we entered into a CodeEvolver® platform technology transfer collaboration and license agreement (the "Merck CodeEvolver® Agreement") with Merck, Sharp & Dohme ("Merck") which allows Merck to use the CodeEvolver® protein engineering technology platform in the field of human and animal healthcare. In 2016, we completed the final phase in the transfer of CodeEvolver® technology to Merck under the Merck CodeEvolver® Agreement.

We recognized research and development revenues of $0.6 million, $3.1 million, and $4.0 million in the years ended December 31, 2021, 2020 and 2019, respectively, for various research projects under our collaborative arrangement.

We have the potential to receive payments of up to a maximum of $15.0 million for each commercial active pharmaceutical ingredient ("API") that is manufactured by Merck using one or more novel enzymes developed by Merck using the CodeEvolver® protein engineering technology platform. The API payments, which are currently not recognized in revenue, are based on the quantity of API developed and manufactured by Merck and will be recognized as usage-based royalties.

In October 2018, we entered into an amendment to the Merck CodeEvolver® Agreement which amended certain licensing provisions and one exhibit. In January 2019, we amended the Merck CodeEvolver® Agreement to install certain CodeEvolver® protein engineering technology upgrades into Merck's platform license installation and maintain those upgrades for a multi-year term expiring in January 2022. The license installation was completed in 2019 and we recognized $0.9 million as license fee revenue accordingly under the amendment. We recognized $0.1 million, $0.1 million and $0.9 million in research and development revenues under the terms of the amendment in 2021, 2020 and 2019 respectively.

Merck Sitagliptin Catalyst Supply Agreement

In February 2012, we entered into a five-year Sitagliptin Catalyst Supply Agreement ("Sitagliptin Supply Agreement") with Merck whereby Merck may obtain commercial scale enzyme for use in the manufacture of Januvia®, its product based on the active ingredient Sitagliptin. In December 2015, Merck exercised its options under the terms of the Sitagliptin Catalyst Supply Agreement to extend the agreement for an additional five years through February 2022. In September 2021, the Sitagliptin Catalyst Supply Agreement was amended to extend the agreement through December 2026.

Effective as of January 2016, we and Merck amended the Sitagliptin Supply Agreement to prospectively provide for variable pricing based on the cumulative volume of sitagliptin enzyme purchased by Merck. We have determined that the variable pricing, which provides a discount based on the cumulative volume of Sitagliptin catalyst purchased by Merck, provides Merck material rights and we are recognizing product revenues over time using the alternative method. Under the alternative approach, we estimate the total expected consideration and allocate it proportionately with the expected sales.

Pursuant to the terms of the Sitagliptin Supply Agreement, Merck may purchase supply of sitagliptin enzyme from us for a fee based on contractually stated prices. We recognized $9.8 million, $13.4 million and $15.1 million in product revenue under this contract for the years ended December 31, 2021, 2020 and 2019, respectively. Revenues recognized by us under the Sitagliptin Supply Agreement comprised 9%, 19%, and 22% of our total revenues for the years ended December 31, 2021, 2020 and 2019, respectively.

As of December 31, 2021, we recorded revenue of $2.8 million from sitagliptin enzyme sales that were recognized over time based on the progress of the manufacturing process. These products will be shipped within the six months period following the end of the quarter.

Enzyme Supply Agreement

In November 2016, we entered into a supply agreement whereby our customer may purchase quantities of one of our proprietary enzymes for use in its commercial manufacture of a product. Pursuant to the supply agreement, we received an upfront payment in December 2016 which was recorded as deferred revenue. Such upfront payment will be recognized over the period of the supply agreement as the customer purchases our proprietary enzyme. We additionally have determined that the volume discounts under the supply agreement provide the customer material rights and we are recognizing revenues using the alternative method. As of December 31, 2021 and 2020, we had deferred revenue balances from the supply agreement of $2.6 million and $2.0 million.

Research and Development Agreement

In March 2017, we entered into a multi-year research and development services agreement with Tate & Lyle Ingredients Americas LLC ("Tate & Lyle") to develop enzymes for use in the manufacture of Tate & Lyle's zero-calorie TASTEVA® M Stevia sweetener. Under the agreement, we received an upfront payment which was recognized ratably over the maximum term of the service period of 21 months.

Commercial Agreement

In April 2019, we entered into a multi-year commercial agreement with Tate & Lyle under which Tate & Lyle has received an exclusive license to use a suite of Codexis novel performance enzymes in the manufacture of Tate & Lyle's zero-calorie stevia sweetener, TASTEVA® M, and other stevia products. Under the agreement, we will supply Tate & Lyle with its requirements for these enzymes over a multiple year period and receive royalties on stevia products. In November 2020, we

amended the commercial agreement based on Tate & Lyle's intent to use a specific Codexis novel performance enzyme in its production of TASTEVA® M Stevia Sweetener and became eligible to receive milestone payments of up to $1.1 million. In the fourth quarter of 2020, we became eligible to receive a milestone payment of $0.4 million which we subsequently received in February 2021.

Global Development, Option and License Agreement and Strategic Collaboration Agreement

In October 2017, we entered into the Nestlé License Agreement with Nestlé Health Science and, solely for the purpose of the integration and the dispute resolution clauses of the Nestlé License Agreement, Nestlé Health Science S.A., to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU.

We received an upfront cash payment of $14.0 million in 2017 upon the execution of the Nestlé License Agreement, a $4.0 million milestone payment received in 2018 after dosing the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, and a $1.0 million milestone payment received in 2019 upon achievement of a milestone relating to formulation of CDX-6114. The upfront payment and the variable consideration relating to the progress payment of $4.0 million and a milestone payment of $1.0 million were recognized over time as the development work was performed. Revenue was recognized using a single measure of progress that depicted our performance in transferring control of the services, which was based on the ratio of level of effort incurred to date compared to the total estimated level of effort required to complete all performance obligations under the agreement. We recognized nil, $13 thousand and $1.9 million in research and development revenue in 2021, 2020 and 2019, respectively.

In January 2019, we received notice from the FDA that it had completed its review of our IND for CDX-6114 and concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU and made an option payment of $3.0 million which we recognized as research and development revenue in 2019. Upon exercising its option, Nestlé Health Science assumed all responsibilities for future clinical development and commercialization of CDX-6114. We are also eligible to receive payments from Nestlé Health Science under the Nestlé License Agreement that include (i) development and approval milestones of up to $85.0 million, (ii) sales-based milestones of up to $250.0 million in the aggregate, which aggregate amount is achievable if net sales exceed $1.0 billion in a single year, and (iii) tiered royalties, at percentages ranging from the mid-single digits to low double-digits of net sales of product.

In October 2017, we entered into the Nestlé SCA pursuant to which we and Nestlé Health Science are collaborating to leverage the CodeEvolver® protein engineering technology platform to develop novel enzymes for Nestlé Health Science's established Consumer Care and Medical Nutrition business areas. The term of the Nestlé SCA has been extended through December 2022.

In January 2020, we entered into a development agreement with Nestlé Health Science pursuant to which we and Nestlé Health Science are collaborating to advance a lead candidate, CDX-7108, targeting a gastrointestinal disorder discovered through our Nestlé SCA into preclinical and early clinical studies. During 2021, we, together with Nestlé Health Science, continued to advance CDX-7108 towards initiation of a Phase 1 clinical trial with the first subject being dosed in November 2021.

Under the Nestlé SCA and the development agreement, we recognized $6.9 million, $7.9 million and $5.4 million in research and development revenue for the years ended December 31, 2021, 2020 and 2019, respectively.

Strategic Collaboration Agreement

In April 2018, we entered into the Porton Agreement with Porton to license key elements of our biocatalyst technology for use in Porton's global custom intermediate and API development and manufacturing business. Under the Porton Agreement, we are eligible to receive annual collaboration fees and research and development revenues. We received initial collaboration payments of $0.5 million and $0.5 million within 30 days of the effective date and on the first anniversary of the effective date of the Porton Agreement, respectively. We also received annual collaboration payments of $1.0 million each during the first through third anniversaries of the effective date of the Porton Agreement and are eligible to receive $1.0 million on the fourth anniversary of the effective date of the Porton Agreement. We completed the technical transfer in the fourth quarter of 2018 and recognized the related revenue in 2018. We recognized revenue related to the functional license provided to Porton at a point in time when control of the license was transferred to the customer. We recognized research and development revenue related to the Porton Agreement of $1.1 million, $1.1 million and nil in the years ended December 31, 2021, 2020 and 2019, respectively.

Platform Technology Transfer and License Agreement

In May 2019, we entered into a Platform Technology Transfer and License Agreement (the "Novartis CodeEvolver® Agreement") with Novartis. The Agreement allows Novartis to use our proprietary CodeEvolver® protein engineering platform technology in the field of human healthcare. In July 2021, we announced the completion of the technology transfer period during which we transferred our CodeEvolver® protein engineering platform technology to Novartis (the "Technology Transfer Period"). As a part of this technology transfer, the Company provided to Novartis our proprietary enzymes, proprietary protein engineering protocols and methods, and proprietary software algorithms. In addition, our teams and Novartis scientists participated in technology training sessions and collaborative research projects at our laboratories in Redwood City, California and at a designated Novartis laboratory in Basel, Switzerland. Novartis has now installed the CodeEvolver® protein engineering platform technology at its designated laboratory.

Pursuant to the agreement, we received an upfront payment of $5.0 million shortly after the effective date of the Novartis CodeEvolver® Agreement. We completed the second technology milestone transfer under the agreement in 2020 and received a milestone payment of $4.0 million. We have also received an aggregate of $5.0 million for the completion of the third technology milestone in 2021 In consideration for the continued disclosure and license of improvements to the technology and materials during a multi-year period that began on the conclusion of the Technology Transfer Period ("Improvements Term"), Novartis will pay Codexis annual payments over four years which amount to an additional $8.0 million in aggregate. The Company also has the potential to receive quantity-dependent, usage payments for each API that is manufactured by Novartis using one or more enzymes that have been developed or are in development using the CodeEvolver® protein engineering platform technology during the period that began on the conclusion of the Technology Transfer Period and ends on the expiration date of the last to expire licensed patent. Revenue for the combined initial license and technology transfer performance obligation was recognized using a single measure of progress that depicted our performance in transferring control of the services. Revenue allocated to improvements made during the Improvements Term are being recognized during the Improvement Term.

We recognized $1.6 million, $6.2 million and $11.3 million in research and development revenue in the year ended December 31, 2021, 2020 and 2019, respectively.

License Agreement

In December 2019, we entered a license agreement with Roche Sequencing Solutions, Inc. ("Roche") to provide Roche with our EvoT4 DNA™ ligase high-performance molecular diagnostic enzyme. The royalty bearing license grants Roche worldwide rights to include the EvoT4 DNA™ ligase in its nucleic acid sequencing products and workflows. Under the license agreement, we received an initial collaboration fee payment of $0.8 million within 45 days of the effective date of the agreement, and we received an additional $0.9 million milestone payment after the completion of technology transfer in October 2020. The agreement also contemplates milestone payments to Codexis upon the achievement of various development and commercialization events and royalty payments from commercial sales of the enzyme. We recognized research and development fees of $0.9 million and $0.9 million for the years ended December 31, 2021 and 2020, respectively.

Strategic Collaboration and License Agreement

In March 2020, we entered into a Strategic Collaboration and License Agreement (the "Takeda Agreement") with Shire Human Genetic Therapies, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Co. Ltd. ("Takeda") under which we are collaborating to research and develop protein sequences for use in gene therapy products for certain diseases (each, a "Field") in accordance with each applicable program plan (each, a "Program Plan").

On execution of the Takeda Agreement in March 2020, we received an upfront nonrefundable cash payment of $8.5 million and we initiated activities under three Program Plans for Fabry Disease, Pompe Disease, and an undisclosed blood factor deficiency respectively (the "Initial Programs"). In May 2021, Takeda elected to exercise its option to initiate an additional program for a certain undisclosed rare genetic disorder; as a result, we received the option exercise fee during the third quarter of 2021. Pursuant to the Takeda Agreement, we are eligible to receive other payments that include (i) reimbursement of research and development fees and preclinical development milestones for the three initial programs of $10.5 million, in aggregate, and $8.3 million for the fourth program, (ii) clinical development and commercialization-based milestones, per target gene, of up to $100.0 million and (iii) tiered royalty payments based on net sales of applicable products at percentages ranging from the mid-single digits to low single-digits.

Revenue recognized relating to the functional licenses provided to Takeda was recognized at a point in time when the control of the license transferred to the customer. We recognized research and development revenue related to the Takeda Agreement of $7.4 million and $13.2 million in the years ended December 31, 2021 and 2020, respectively. As of December 31, 2021 and 2020, we had deferred revenue balances of $2.2 million and $1.5 million, respectively.

Master Collaboration and Research Agreement and Stock Purchase Agreement

In June 2020, we entered into a Stock Purchase Agreement with MAI in which we purchased 1,587,050 shares of MAI's Series A preferred stock for $1.0 million. In connection with the June 2020, transaction, John Nicols, our President and Chief Executive Officer, joined MAI's board of directors. For additional information, see Note 14, "Related Party Transactions".

Concurrent with our initial equity investment, we entered into a Master Collaboration and Research Agreement with MAI (the "MAI Agreement") in June 2020, pursuant to which we are performing services utilizing our CodeEvolver® protein engineering platform technology to improve DNA polymerase enzymes in exchange for compensation in the form of additional shares of MAI's preferred stock. Based on these services, the Company is eligible to earn additional shares of MAI's preferred stock. MAI will combine its advanced chemistries with our enzymes to drive the process to commercialization. We are eligible to earn such non-monetary payments over 14 months, and any such shares would be issued thirty days in arrears after each calendar quarter-end. We are also eligible to receive amounts for bonuses, targets and milestones on achievement of timeline and project goals specified in the statement of work ("SOW"). Payments for bonuses, targets and milestones on achievement of timeline and project goals are to be issued thirty days after the Company provides notification of completion. Under the MAI Agreement, we will have the right to use and sell the engineered enzymes to third parties for any purpose other than for the synthesis of native DNA. Under the MAI Agreement, we would make a $0.5 million payment to MAI upon our achievement of a milestone of $5.0 million in aggregate commercial sales to third parties of the engineered enzymes or any product incorporating or derived from the engineered enzymes for any purpose other than the synthesis of native DNA. The MAI Agreement contemplates that we and MAI will enter into a Commercialization and Enzyme Supply Agreement (the "CESA") within six months following the completion of certain timelines specified in the SOW. In addition, we and MAI have agreed to certain terms to be contained within the CESA in the event that the CESA becomes executed in the future. Those include: (a) that MAI would receive an exclusive license to use the DNA polymerase enzymes engineering by us under the MAI Agreement in the synthesis of native DNA and a non-exclusive license to use these enzymes for research and development on the synthesis of non-native DNA, and (b) we would become the exclusive manufacturer of these enzymes for MAI, its affiliates and licensees.

We received 3,491,505 and 714,171 shares of MAI's Series A and B preferred stock and recognized $2.0 million and $0.9 million from these services in the years ended December 31, 2021 and 2020, respectively. Payment for the services rendered was received in the form of additional MAI Series A and Series B preferred stock.

Pfizer purchase orders

In the first and second quarters of 2021, we began to receive purchase orders from Pfizer, Inc. ("Pfizer") for large quantities of our proprietary enzyme product, CDX-616, for use by Pfizer in the manufacture of a critical intermediate for its proprietary active pharmaceutical ingredient, nirmatrelvir. Pfizer markets, sells and distributes nirmatrelvir, in combination with the active pharmaceutical ingredient ritonavir, as its PAXLOVID™ (nirmatrelvir tablets; ritonavir tablets) product, which received emergency use authorization by the U.S. Food and Drug Administration ("FDA") in late 2021 for the treatment of COVID-19 infections in humans.

We recognized product revenue of $34.5 million from the sale of quantities of CDX-616 enzyme products to Pfizer in 2021. Revenues recognized by us from the sale to Pfizer comprised 33% of our total revenues for the year ended December 31, 2021. As of December 31, 2021, we recorded revenue and contract assets of $1.7 million from the sale of this enzyme product that were recognized over time based on the progress of the manufacturing process.

Note 6. Investments in Non-Marketable Securities

Non-Marketable Debt Securities

We classify non-marketable debt securities, which are accounted for as available-for-sale, within Level 3 in the fair value hierarchy because we estimate the fair value based on a qualitative analysis using the most recent observable transaction price and other significant unobservable inputs including volatility, rights, and obligations of the securities we hold.

We determine gains or losses on the sale or extinguishment of non-marketable debt securities using a specific identification method. Unrealized gains and losses from bifurcated embedded derivatives, which represent share-settled redemption features, are recorded as other expense, net, in the consolidated statements of operations. Unrealized gains and losses on non-marketable debt securities are recorded as a component of other comprehensive loss until realized. Realized gains or losses are recorded as a component of other income (expense), net.

In November 2020, we purchased convertible subordinated notes issued by Arzeda Corp., an early-stage computational protein design company, for $1.0 million. The investment was classified as available-for-sale non-marketable interest-bearing debt securities with a carrying value of $1.0 million as of December 31, 2020. In July 2021, we converted the non-marketable debt security with a carrying value of $1.3 million into 207,070 shares of Series B-2 preferred stock of Arzeda Corp. During the year ended December 31, 2021, we recognized $0.3 million in interest income from interest earned on our investment in this debt security.

There were no investments in non-marketable debt securities at December 31, 2021. As of December 31, 2020, the adjusted cost, carrying value and fair value of the non-marketable debt security is the following (in thousands):

	December 31, 2020	
	Adjusted Cost and Carrying Value	Fair Value
Non-marketable debt securities due in 1 year or less	$ 1,000	$ 1,000

Non-Marketable Equity Securities

Our non-marketable equity securities are investments in privately held companies without readily determinable market value and primarily relate to our investments in MAI and Arzeda Corp. These investments are accounted for under the measurement alternative and are measured at cost minus impairment, if any, plus or minus changes resulting from observable price changes for identical or similar security of the same issuer. Non-marketable equity securities are measured at fair value on a non-recurring basis and classified within Level 2 in the fair value hierarchy because we estimate the fair value of these using the observable transaction price paid by third party investors for the same or similar security of the same issuers. We adjust the carrying value of non-marketable equity securities which have been remeasured during the period and recognize resulting gains or losses as a component of other income (expense), net in the consolidated statements of operations.

For the year ended December 31, 2021, we recognized a $1.0 million unrealized gain in other income (expense), net, in the consolidated statements of operations, and included as adjustment to the carrying value of our investment in MAI based on an analysis of observed transaction price from MAI's recent round of financing during the third and fourth quarter of 2021. There was no remeasurement event for our investment in MAI and Arzeda Corp that occurred during the remainder of 2021. We recognized no realized gains or losses during the years ended December 31, 2021 and 2020. The carrying value of our investment in MAI was $12.7 million and $1.5 million at December 31, 2021 and December 31, 2020, respectively. The carrying value of our investment in Arzeda Corp. was $1.3 million at December 31, 2021.

The following table presents the carrying value of non-marketable equity securities (in thousands):

	December 31, 2021	December 31, 2020
Non-marketable equity securities	$ 14,002	$ 1,450

Note 7. Fair Value Measurements

The following tables present the financial instruments that were measured at fair value on a recurring basis at December 31, 2021 and 2020 by level within the fair value hierarchy (in thousands):

	December 31, 2021			
	Level 1	Level 2	Level 3	Total
Money market funds	$ 86,095	$ —	$ —	$ 86,095

	December 31, 2020			
	Level 1	Level 2	Level 3	Total
Money market funds	$ 127,567	$ —	$ —	$ 127,567
Non-marketable debt security	—	—	1,000	1,000
Total	$ 127,567	$ —	$ 1,000	$ 128,567

During the years ended December 31, 2021 and 2020, we did not recognize any significant credit losses nor other-than-temporary impairment losses on non-marketable securities.

Note 8. Balance Sheet Details

Cash Equivalents

Cash equivalents consisted of the following (in thousands):

	December 31, 2021		December 31, 2020	
	Adjusted Cost	Estimated Fair Value	Adjusted Cost	Estimated Fair Value
Money market funds [1]	$ 86,095	$ 86,095	$ 127,567	$ 127,567

[1] Money market funds are classified in cash and cash equivalents on our consolidated balance sheets. Average contractual maturities (in days) is not applicable.

As of December 31, 2021, the total cash and cash equivalents balance of $116.8 million consisted of money market funds of $86.1 million and cash of $30.7 million held with major financial institutions. As of December 31, 2020, the total cash and cash equivalents balance of $149.1 million consisted of money market funds of $127.6 million and cash of $21.5 million held with major financial institutions.

Inventories

Inventories consisted of the following (in thousands):

	December 31,	
	2021	2020
Raw materials	$ 49	$ 77
Work in process	65	82
Finished goods	1,046	805
Inventories	$ 1,160	$ 964

Inventories are recorded net of reserves of $1.4 million and $1.5 million as of December 31, 2021 and December 31, 2020 respectively.

Property and Equipment, net

Property and equipment, net consisted of the following (in thousands):

	December 31,	
	2021	2020
Laboratory equipment [1]	$ 33,101	$ 25,468
Leasehold improvements	16,117	10,785
Computer equipment and software	3,481	3,192
Office equipment and furniture	1,297	1,246
Construction in progress [2]	3,231	2,357
Property and equipment	57,227	43,048
Less: accumulated depreciation and amortization	(35,882)	(33,373)
Property and equipment, net	$ 21,345	$ 9,675

[1] Fully depreciated property and equipment with a cost of $0.6 million and $1.8 million were retired during the years ended December 31, 2021 and 2020, respectively.

[2] Construction in progress includes equipment received but not yet placed into service pending installation.

Depreciation expense included in both research and development expenses and selling, general and administrative expenses in the consolidated statements of operations was as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Depreciation expense	$ 3,113	$ 1,950	$ 1,570

Goodwill

Goodwill had a carrying value of $3.2 million as of December 31, 2021 and 2020.

Other Accrued Liabilities

Other accrued liabilities consisted of the following (in thousands):

	December 31,	
	2021	2020
Accrued purchases	$ 6,755	$ 7,170
Accrued professional and outside service fees	5,147	2,589
Other	676	513
Total	$ 12,578	$ 10,272

Note 9. Stock-based Compensation

Equity Incentive Plans

In 2019, our board of directors (the "Board") and stockholders approved the 2019 Incentive Award Plan (the "2019 Plan"). The 2019 Plan superseded and replaced in its entirety our 2010 Equity Incentive Plan (the “2010 Plan”) which was effective in March 2010, and no further awards will be granted under the 2010 Plan; however, the terms and conditions of the 2010 Plan will continue to govern any outstanding awards thereunder.

The 2019 Plan provides for the grant of stock options, including incentive stock options and non-qualified stock options, stock appreciation rights, restricted stock awards ("RSAs"), restricted stock units ("RSUs"), performance-contingent restricted stock units ("PSUs"), performance-based options ("PBOs"), other stock or cash-based awards and dividend equivalents to eligible employees and consultants of the Company or any parent or subsidiary, as well as members of the Board.

The number of shares of our common stock available for issuance under the 2019 Plan is equal to the sum of (i) 7,897,144 shares and (ii) any shares subject to awards granted under the 2010 Plan that were outstanding as of April 22, 2019 and thereafter terminate, expire, lapse or are forfeited; provided that no more than 14,000,000 shares may be issued upon the exercise of incentive stock options (“ISOs”). In June 2019, 8.1 million shares authorized for issuance under the 2019 Plan were registered under the Securities Act of 1933, as amended (the “Securities Act”).

The 2010 Plan provided for the grant of incentive stock options, non-statutory stock options, RSUs, RSAs, PSUs, PBOs, stock appreciation rights, and stock purchase rights to our employees, non-employee directors and consultants.

As of December 31, 2021, total shares remaining available for issuance under the 2019 Plan were 5.9 million shares.

Stock Options

The option exercise price for incentive stock options must be at least 100% of the fair value of our common stock on the date of grant and the option exercise price for non-statutory stock options is at least 85% of the fair value of our common stock on the date of grant, as determined by the Board. If, at the time of a grant, the optionee directly or by attribution owns stock possessing more than 10% of the total combined voting power of all of our outstanding capital stock, the exercise price for these options must be at least 110% of the fair value of the underlying common stock. Stock options granted to employees generally have a maximum term of ten years and vest over four years from the date of grant, of which 25% vest at the end of one year, and 75% vest monthly over the remaining three years. We may grant options with different vesting terms from time to time. Unless an employee's termination of service is due to disability or death, upon termination of service, any unexercised vested options will be forfeited at the end of three months or the expiration of the option, whichever is earlier.

Restricted Stock Units ("RSUs")

We also grant employees RSUs, which generally vest over either a three year period with 33% of the shares subject to the RSUs vesting on each yearly anniversary of the vesting commencement date or over a four-year period with 25% of the shares subject to the RSU vesting on each yearly anniversary of the vesting commencement date, in each case contingent upon such employee's continued service on such vesting date. RSUs are generally subject to forfeiture if employment terminates prior to the release of vesting restrictions. We may grant RSUs with different vesting terms from time to time.

Performance-contingent Restricted Stock Units ("PSUs") and Performance Based Options ("PBOs")

The compensation committee of the Board approved, solely in respect of non-executive employees, delegated to our Chief Executive Officer the authority to approve grants of PSUs. The compensation committee of the Board also approved grants of PBOs and PSUs to our executives. The PSUs and PBOs vest based upon both the successful achievement of certain corporate operating milestones in specified timelines and continued employment through the applicable vesting date. When the performance goals are deemed to be probable of achievement for these types of awards, recognition of stock-based compensation expense commences. Once the number of shares eligible to vest is determined, those shares vest in two equal installments with 50% vesting upon achievement and the remaining 50% vesting on the first anniversary of achievement, in each case, subject to the recipient's continued service through the applicable vesting date. If the performance goals are achieved at the threshold level, the number of shares eligible to vest in respect of the PSUs and PBOs would be equal to half the number of PSUs granted and one-quarter the number of shares underlying the PBOs granted. If the performance goals are achieved at the target level, the number of shares eligible to vest in respect of the PSUs and PBOs would be equal to the number of PSUs granted and half of the shares underlying the PBOs granted. If the performance goals are achieved at the superior level, the number of shares eligible to vest in respect of the PSUs would be equal to two times the number of PSUs granted and equal to the number of PBOs granted. The number of shares issuable upon achievement of the performance goals at the levels between the threshold and target levels for the PSUs and PBOs or between the target level and superior levels for the PSUs would be determined using linear interpolation. Achievement below the threshold level would result in no shares being eligible to vest in respect of the PSUs and PBOs.

In 2021, we awarded PSUs ("2021 PSUs") and PBOs ("2021 PBOs"), each of which commenced vesting based upon the achievement of various weighted performance goals, including corporate revenue, performance enzyme segment gross margin, major new biotherapeutics publicity events, strategic performance enzyme and biotherapeutics deliverables, safety, and technology and strategic plan development. As of December 31, 2021, we estimated that the 2021 PSUs and 2021 PBOs performance goals would be achieved at 146% and 73% of the target level, respectively, and recognized stock-based compensation expenses accordingly.

In 2020, we awarded PSUs ("2020 PSUs") and PBOs ("2020 PBOs"), each of which commenced vesting based upon the achievement of various weighted performance goals, including corporate revenue, performance enzyme segment gross margin, major new biotherapeutics publicity events, strategic performance enzyme and biotherapeutics deliverables, and strategic plan development. In the first quarter of 2021, we determined that the 2020 PSUs and 2020 PBOs performance goals had been achieved at 88% and 44% of the target level, respectively, and recognized the stock-based compensation expenses accordingly. Accordingly, 50% of the shares underlying the 2020 PSUs and PBOs vested in the first quarter of 2021 and 50% of the shares underlying the 2020 PSUs and PBOs will vest in the first quarter of 2022, in each case, subject to the recipient's continued service on each vesting date.

In 2019, we awarded PSUs ("2019 PSUs") and PBOs ("2019 PBOs"), each of which commenced vesting based upon the achievement of various weighted performance goals, including sustained revenue and performance enzyme growth, strategic advancement of biotherapeutics, cash balance and strategic plan development. In the first quarter of 2020, we determined that the 2019 PSUs and 2019 PBOs performance goals had been achieved at 84% and 42% of the target level, respectively, and recognized the stock-based compensation expenses accordingly. Accordingly, 50% of the shares underlying the 2019 PSUs and PBOs vested in the first quarter of 2020 and 50% of the shares underlying the 2019 PSUs and PBOs vested in the first quarter of 2021, in each case subject to the recipient's continued service on each vesting date.

Stock-Based Compensation Expense

Stock-based compensation expense is included in the consolidated statements of operations as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Research and development	$ 2,353	$ 1,620	$ 1,562
Selling, general and administrative	9,240	6,108	5,381
Total	$ 11,593	$ 7,728	$ 6,943

The following table presents total stock-based compensation expense by security type included in the consolidated statements of operations (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Stock options	$ 2,764	$ 2,381	$ 2,149
RSUs and RSAs	2,768	2,231	1,805
PSUs	2,333	1,160	1,087
PBOs	3,728	1,956	1,902
Total	$ 11,593	$ 7,728	$ 6,943

Grant Award Activities:

Stock Option Awards

We estimated the fair value of stock options using the Black-Scholes-Merton option-pricing model based on the date of grant. The following summarizes the weighted-average assumptions used to estimate the fair value of employee and non-employee stock options granted:

	Year Ended December 31,		
	2021	2020	2019
Expected life (years)	5.6	5.3	5.6
Volatility	52.5 %	50.4 %	55.3 %
Risk-free interest rate	0.8 %	1.0 %	2.4 %
Expected dividend yield	0.0 %	0.0 %	0.0 %

The following summarizes the weighted-average assumptions used to estimate the fair value of 9,000 and 76,000 shares of stock options granted to non-employees for services valued at $0.1 million and $0.4 million during the years ended December 31, 2021 and 2020 respectively:

	Year Ended December 31,	
	2021	2020
Expected life (years)	5.6	5.4
Volatility	54.1 %	51.6 %
Risk-free interest rate	0.9 %	0.4 %
Expected dividend yield	0.0 %	0.0 %

The weighted average grant date fair value per share of non-employee stock options granted respectively in 2021 and 2020 was $11.29 and $5.04. The Company did not grant shares of stock options to non-employees during the year ended December 31, 2019.

The following tables summarizes stock option activities:

	Number of Shares	Weighted Average Exercise Price Per Share
	(In Thousands)	
Outstanding at December 31, 2018	4,112	$ 4.81
Granted	406	$ 20.68
Exercised	(1,045)	$ 4.50
Forfeited/Expired	(326)	$ 11.01
Outstanding at December 31, 2019	3,147	$ 6.31
Granted	496	$ 13.30
Exercised	(210)	$ 6.30
Forfeited/Expired	(48)	$ 16.71
Outstanding at December 31, 2020	3,385	$ 7.19
Granted	286	$ 26.85
Exercised	(664)	$ 6.96
Forfeited/Expired	(72)	$ 17.99
Outstanding at December 31, 2021	2,935	$ 8.90

	Number of Shares	Weighted Average Exercise Price Per Share	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value
	(In Thousands)		(In Years)	(In Thousands)
Outstanding at December 31, 2021	2,935	$ 8.90	5.0	$ 65,963
Exercisable at December 31, 2021	2,861	$ 8.56	4.9	$ 65,186
Vested and expected to vest at December 31, 2021	2,338	$ 5.99	4.2	$ 59,103

The weighted average grant date fair value per share of employee stock options granted in 2021, 2020 and 2019 were $12.80, $6.03 and $10.77, respectively. The total intrinsic value of options exercised in 2021, 2020 and 2019 were $14.9 million, $1.8 million and $13.6 million, respectively.

As of December 31, 2021, there was $4.4 million of unrecognized stock-based compensation, net of expected forfeitures, related to unvested stock options, which we expect to recognize over a weighted average period of 2.4 years.

Restricted Stock Awards ("RSAs")

The following table summarizes RSA activities:

	Number of Shares	Weighted Average Grant Date Fair Value Per Share
	(In Thousands)	
Non-vested balance at December 31, 2018	55	$ 12.83
Granted	40	$ 17.18
Vested	(56)	$ 12.83
Forfeited/Expired	(4)	$ 17.18
Non-vested balance at December 31, 2019	35	$ 17.18
Granted	96	$ 11.44
Vested	(35)	$ 17.18
Non-vested balance at December 31, 2020	96	$ 11.44
Granted	46	$ 21.91
Vested	(62)	$ 11.31
Non-vested balance at December 31, 2021	80	$ 17.53

The total fair value, as of the vesting date, of RSAs vested in fiscal 2021, 2020 and 2019 were $1.3 million, $0.4 million and $1.0 million respectively.

As of December 31, 2021, there was $0.7 million of unrecognized stock-based compensation cost related to non-vested RSAs, which we expect to recognize over a weighted average period of 1.1 years.

Restricted Stock Units ("RSUs")

The following table summarizes RSU activities:

	Number of Shares	Weighted Average Grant Date Fair Value Per Share
	(In Thousands)	
Non-vested balance at December 31, 2018	348	$ 5.66
Granted	72	$ 19.19
Vested	(210)	$ 5.03
Forfeited/Expired	(9)	$ 13.60
Non-vested balance at December 31, 2019	201	$ 10.76
Granted	156	$ 14.22
Vested	(168)	$ 10.05
Forfeited/Expired	(13)	$ 15.16
Non-vested balance at December 31, 2020	176	$ 14.17
Granted	163	$ 26.59
Vested	(70)	$ 13.57
Forfeited/Expired	(37)	$ 21.89
Non-vested balance at December 31, 2021	232	$ 21.83

The total fair value, as of the vesting date, of RSUs vested in fiscal 2021, 2020 and 2019 were $1.8 million, $2.1 million and $4.1 million respectively.

As of December 31, 2021, there was $2.8 million of unrecognized stock-based compensation cost related to non-vested RSUs, which we expect to recognize over a weighted average period of 1.6 years.

Performance-Contingent Restricted Stock Units ("PSUs")

The following table summarizes PSU activities:

	Number of Shares	Weighted Average Grant Date Fair Value Per Share
	(In Thousands)	
Non-vested balance at December 31, 2018	240	$ 7.48
Granted	95	$ 14.98
Vested	(200)	$ 6.58
Forfeited/Expired	(15)	$ 15.58
Non-vested balance at December 31, 2019	120	$ 13.88
Granted	124	$ 13.59
Vested	(107)	$ 11.28
Forfeited/Expired	(6)	$ 21.80
Non-vested balance at December 31, 2020	131	$ 15.34
Granted	82	$ 26.16
Vested	(66)	$ 16.14
Forfeited/Expired	(19)	$ 19.38
Non-vested balance at December 31, 2021	128	$ 21.24

The total fair value, as of the vesting date, of PSUs vested in the years ended December 31, 2021, 2020, and 2019 were $1.3 million, $1.3 million, and $3.8 million, respectively.

As of December 31, 2021, there was $1.0 million of unrecognized stock-based compensation cost related to non-vested PSUs, which we expect to recognize over a weighted average period of 0.5 years.

Performance Based Options ("PBOs")

We estimated the fair value of PBOs using the Black-Scholes-Merton option-pricing model based on the date of grant. The following summarize the ranges of weighted-average assumptions used to estimate the fair value of employee stock options granted:

	Year Ended December 31,		
	2021	2020	2019
Expected life (years)	5.5	5.3	5.6
Volatility	51.9 %	49.9 %	55.8 %
Risk-free interest rate	0.7 %	1.3 %	2.5 %
Expected dividend yield	0.0 %	0.0 %	0.0 %

The following tables summarizes PBO activities:

	Number of Shares	Weighted Average Grant Date Fair Value Per Share
	(In Thousands)	
Outstanding at December 31, 2018	1,582	$ 3.47
Granted	718	$ 11.44
Exercised	(422)	$ 3.17
Forfeited/Expired	(618)	$ 10.34
Outstanding at December 31, 2019	1,260	$ 4.75
Granted	689	$ 6.37
Forfeited/Expired	(389)	$ 6.42
Outstanding at December 31, 2020	1,560	$ 5.05
Granted	433	$ 12.23
Exercised	(35)	$ 9.02
Forfeited/Expired	(118)	$ 12.23
Outstanding at December 31, 2021	1,840	$ 4.11

	Number of Shares	Weighted Average Exercise Price Per Share	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value
	(In Thousands)		(In Years)	(In Thousands)
Exercisable at December 31, 2021	1,374	$ 9.08	6.0	$ 30,8(
Vested and expected to vest at December 31, 2021	1,784	$ 12.11	6.6	$ 34,2(

The total fair value of exercised PBOs for 2021, 2020 and 2019, was $0.3 million, nil and $1.3 million, respectively.

As of December 31, 2021, there was $1.3 million of unrecognized stock-based compensation cost related to non-vested PBOs, which we expect to recognize over a weighted average period of 1.0 years.

Note 10. Capital Stock

Equity Distribution Agreement

We filed a Registration Statement on Form S-3 with the SEC, under which we may sell common stock, preferred stock, debt securities, warrants, purchase contracts, and units from time to time in one or more offerings. The registration statement became effective on May 7, 2021. In May 2021, we entered into an Equity Distribution Agreement ("EDA") with Piper Sandler & Co ("PSC"), under which PSC, as our exclusive agent, at our discretion and at such times that we may determine from time to time, may sell over a three-year period from the execution of the EDA up to a maximum of $50.0 million of shares of our common stock. Under the terms of the EDA, PSC may sell the shares at market prices by any method that is deemed to be an“at the market offering” as defined in Rule 415 under the Securities Act of 1933, as amended.

We are not required to sell any shares at any time during the term of the EDA. The EDA will terminate upon the earlier of: (i) the issuance and sale of all shares through PSC on the terms and conditions of the EDA, or (ii) the termination of the EDA in accordance with its terms. Either party may terminate the EDA at any time upon written notification to the other party in accordance with the EDA, and upon such notification, the offering will terminate. Under no circumstances shall any shares be sold pursuant to the EDA after the date which is three years after the registration statement is first declared effective by the SEC. We agreed to pay PSC a commission of 3% of the gross sales price of any shares sold pursuant to the EDA. With the exception of certain expenses, we will pay PSC up to 8% of the gross sales price of the shares sold pursuant to the EDA for a combined amount of commission and reimbursement of PSC's expenses and fees.

During the year ended December 31, 2021, no shares of our common stock were issued pursuant to the EDA. As of December 31, 2021, $50.0 million of shares remained available for sale under the EDA.

Public Offerings

In December 2020, we completed an underwritten public offering in which we issued and sold 4.9 million shares of our common stock, par value $0.0001 per share, at a public offering price of $17.50 per share. We received gross proceeds of $86.3 million, net of underwriting discounts and commissions of $5.2 million and direct offering expenses of $0.3 million for net proceeds of $80.8 million.

Private Placement

In June 2019, we entered into a Securities Purchase Agreement with an affiliate of Casdin Capital, LLC ("Casdin") pursuant to which we issued and sold to Casdin 3,048,780 shares of our common stock at a purchase price of $16.40 per share. After deducting issuance costs of $0.1 million from the Private Offering, our net proceeds were $49.9 million. The Private Offering was exempt from registration pursuant to the exemption for transactions by an issuer not involving any public offering under Section 4(a)(2) the Securities Act, and Regulation D under the Securities Act.

Note 11. 401(k) Plan

In January 2005, we implemented a 401(k) Plan covering certain employees. Currently, all of our United States based employees over the age of 18 are eligible to participate in the 401(k) Plan. Under the 401(k) Plan, eligible employees may elect to reduce their current compensation up to a certain annual limit and contribute these amounts to the 401(k) Plan. We may make matching or other contributions to the 401(k) Plan on behalf of eligible employees. We recorded employer matching contributions expense of $1.1 million, $0.8 million, and $0.7 million in the years ended December 31, 2021, 2020, and 2019, respectively.

Note 12. Income Taxes

Our loss before provision for (benefit from) income taxes were as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
United States	$ (21,037)	$ (23,452)	$ (11,751)
Foreign	(53)	(219)	(167)
Loss before provision for income taxes	$ (21,090)	$ (23,671)	$ (11,918)

The tax provision for the years ended December 31, 2021, 2020 and 2019 consists primarily of taxes attributable to foreign operations. The components of the provision for income taxes are as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Current provision:			
State	$ —	$ 5	$ 5
Foreign	198	342	18
Total current provision	$ 198	$ 347	$ 23
Deferred benefit:			
Foreign	(9)	(8)	(6)
Total deferred benefit	$ (9)	$ (8)	$ (6)
Provision for income taxes	$ 189	$ 339	$ 17

Reconciliation of the provision for income taxes calculated at the statutory rate to our provision for income taxes is as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Tax benefit at federal statutory rate	$ (4,429)	$ (4,971)	$ (2,503)
State taxes	(2,235)	(708)	(1,120)
Research and development credits	(1,132)	(811)	(693)
Foreign operations taxed at different rates	80	245	1
Stock-based compensation	(2,698)	140	(3,599)
Other nondeductible items	711	61	498
Executive compensation	257	24	872
Change in valuation allowance	9,635	6,359	6,561
Provision for income taxes	$ 189	$ 339	$ 17

Deferred income taxes reflect the net tax effects of (a) temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes, and (b) operating losses and tax credit carryforwards.

Significant components of our deferred tax assets and liabilities are as follows (in thousands):

	December 31,	
	2021	2020
Deferred tax assets:		
Net operating losses	$ 78,525	$ 72,530
Credits	11,895	9,914
Deferred revenues	1,490	1,080
Stock-based compensation	3,946	2,576
Reserves and accruals	2,928	1,914
Depreciation	514	1,115
Intangible assets	1,356	1,714
Capital losses	26	25
Unrealized gain/loss	418	400
Lease liability	11,206	5,626
Other assets	122	100
Total deferred tax assets:	112,426	96,994
Valuation allowance	(101,762)	(92,126)
Deferred tax liabilities:		
Right-of-use assets	(10,373)	(4,848)
Other	(314)	(52)
Total deferred tax liabilities:	(10,687)	(4,900)
Net deferred tax liabilities	$ (23)	$ (32)

ASC 740 requires that the tax benefit of NOLs, temporary differences and credit carryforwards be recorded as an asset to the extent that management assesses that realization is “more likely than not.” Realization of the future tax benefits is dependent on our ability to generate sufficient taxable income within the carryforward period. Because of our history of operating losses, management believes that recognition of the deferred tax assets arising from the above-mentioned future tax benefits is currently not more likely than not to be realized and, accordingly, has provided a valuation allowance against our deferred tax assets. Accordingly, the net deferred tax assets in all our jurisdictions have been fully reserved by a valuation allowance. The net valuation allowance increased by $9.6 million during the year ended December 31, 2021, increased by $6.4 million during the year ended December 31, 2020, and increased by $6.5 million during the year ended December 31, 2019. At such time as it is determined that it is more likely than not that the deferred tax assets are realizable, the valuation allowance will be reduced.

The following table sets forth our federal, state and foreign NOL carryforwards and federal research and development tax credits as of December 31, 2021 (in thousands):

	December 31, 2021	
	Amount	Expiration Years
Net operating losses, federal	$ 224,475	2022-2037
Net operating losses, federal	$ 108,314	Do not expire
Net operating losses, state	$ 138,770	2028-2041
Tax credits, federal	$ 12,917	2023-2041
Tax credits, state	$ 14,126	Do not expire
Net operating losses, foreign	$ —	Various

Current U.S. federal and California tax laws include substantial restrictions on the utilization of NOLs and tax credit carryforwards in the event of an ownership change of a corporation. Accordingly, the Company's ability to utilize NOLs and tax credit carryforwards may be limited as a result of such ownership changes. We performed an analysis in 2020 and determined that there was not a limitation that would result in the expiration of carryforwards before they are utilized.

Income tax expense or benefit from continuing operations is generally determined without regard to other categories of earnings, such as discontinued operations and other comprehensive income. An exception is provided in ASC 740 when there is aggregate income from categories other than continuing operations and a loss from continuing operations in the current year. In this case, the tax benefit allocated to continuing operations is the amount by which the loss from continuing operations reduces the tax expenses recorded with respect to the other categories of earnings, even when a valuation allowance has been established against the deferred tax assets. In instances where a valuation allowance is established against current year losses, income from other sources is considered when determining whether sufficient future taxable income exists to realize the deferred tax assets.

In 2014, we determined that the undistributed earnings of our India subsidiary will be repatriated to the United States, and accordingly, we have provided a deferred tax liability totaling $23 thousand and $32 thousand as of December 31, 2021 and 2020 respectively, for local taxes that would be incurred upon repatriation.

We apply the provisions of ASC 740 to account for uncertain income taxes. A reconciliation of the beginning and ending amount of unrecognized tax benefits is as follows (in thousands):

	December 31,		
	2021	2020	2019
Balance at beginning of year	$ 12,683	$ 11,330	$ 9,980
Additions based on tax positions related to current year	2,206	1,357	1,362
Additions to tax position of prior years	372	—	—
Reductions to tax position of prior years	—	(4)	(12)
Balance at end of year	$ 15,261	$ 12,683	$ 11,330

We recognize interest and penalties as a component of our income tax expense. Total interest and penalties recognized in the consolidated statements of operations were $61 thousand, $39 thousand and $32 thousand in 2021, 2020 and 2019, respectively. Total penalties and interest recognized in the balance sheet was $0.5 million, $0.4 million and $0.4 million as of December 31, 2021, 2020 and 2019, respectively. The total unrecognized tax benefits that, if recognized currently, would impact our company’s effective tax rate were $0.3 million as of December 31, 2021, 2020 and 2019. We do not expect any material changes to our uncertain tax positions within the next 12 months. We are not subject to examination by United States federal or state tax authorities for years prior to 2002 and foreign tax authorities for years prior to 2014.

Note 13. Commitments and Contingencies

Operating Leases

Our headquarters are located in Redwood City, California, where we occupy approximately 77,300 square feet of office and laboratory space in multiple buildings within the same business park of Metropolitan Life Insurance Company ("MetLife"). Our lease agreement with MetLife ("RWC Lease") includes approximately 28,200 square feet of space located at 200 and 220 Penobscot Drive, Redwood City, California (the "200/220 Penobscot Space") and approximately 37,900 square feet of space located at 400 Penobscot Drive, Redwood City, California (the "400 Penobscot Space") (the 200/220 Penobscot Space and the 400 Penobscot Space are collectively referred to as the "Penobscot Space"), and approximately 11,200 square feet of space located at 501 Chesapeake Drive, Redwood City, California (the "501 Chesapeake Space").

Until the end of January 2020, we also leased approximately 29,900 square feet of space located at 101 Saginaw Drive, Redwood City, California (the "Saginaw Space"). During January 2020, we subleased approximately 26,500 square feet of the Saginaw Space to Minerva Surgical, Inc. The lease and sublease for the Saginaw Space both expired at the end of January 2020. During the period from February 1, 2020 through April 30, 2020, we subleased approximately 3,400 square feet at 101 Saginaw Drive from Minerva Surgical, Inc. The sublease expired at the end of April 2020.

We entered into the initial lease with MetLife for our facilities in Redwood City in 2004 and the RWC Lease has been amended multiple times since then to adjust the leased space and terms of the Lease. In February 2019, we entered into an Eighth Amendment to the Lease (the "Eighth Amendment") with MetLife with respect to the Penobscot Space and the 501 Chesapeake Space to extend the term of the Lease for additional periods. Pursuant to the Eighth Amendment, the term of the lease of the Penobscot Space has been extended through May 2027. The lease term for the 501 Chesapeake Space has been extended to May 2029. We have one (1) option to extend the term of the lease for the Penobscot Space for five (5) years, and one (1) separate option to extend the term of the lease for the 501 Chesapeake Space for five (5) years.

Pursuant to the terms of the RWC Lease, we exercised our right to deliver a letter of credit in lieu of a security deposit. The letter of credit is collateralized by deposit balances held by the bank in the amount of $1.1 million as of December 31, 2021 and 2020, and are recorded as non-current restricted cash on the consolidated balance sheets.

We entered into a short-term office lease in San Carlos, California during the second quarter of 2021 and this lease will expire in April 2022. Our remaining future commitment pursuant to this lease is $40 thousand as of December 31, 2021.

In January 2021, we entered into a lease agreement with ARE-San Francisco No. 63, LLC ("ARE") to lease a portion of a facility comprising approximately 36,593 rentable square feet in San Carlos, California to serve as additional office and research and development laboratory space (the "San Carlos Space"). The budget provided a net tenant improvement allowance of $6.3 million and an additional allowance of up to $2.7 million. ARE will have an enforceable right to payment by us in the form of equal monthly additional rent payments at a certain interest rate through the lease term for the additional allowance. The terms include an initial annualized base rent of $2.5 million, subject to scheduled 3% annual rent increases, an annualized additional allowance payment of $0.4 million, plus certain operating expenses. The lease has a 10-year term from the lease commencement date with one option to extend the term for an additional period of 5 years. We have provided ARE with a $0.5 million security deposit in the form of a letter of credit. We have the right to sublease the facility, subject to landlord consent. We commenced occupancy of the San Carlos Space in December 2021 and recognized the right of use asset and the corresponding operating lease liability.

We are required to restore certain areas of the Redwood City and San Carlos facilities that we are renting to their original form. We are expensing the asset retirement obligation over the terms of the respective leases. We review the estimated obligation each reporting period and make adjustments if our estimates change. We recorded asset retirement obligations of $0.4 million and $0.2 million as of December 31, 2021 and 2020, respectively, which are included in other liabilities on the consolidated balance sheets. Accretion expense related to our asset retirement obligations was nominal in 2021 and 2020.

Lease and other information

Lease costs, amounts included in measurement of lease obligations and other information related to non-cancellable operating leases and finance leases for the years ended December 31, 2021, 2020 and 2019 were as follows (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Amortization of right-of-use assets	$ 106	$ 152	$ 217
Interest on lease obligations	—	1	10
Finance lease costs	106	153	227
Operating lease cost	4,396	3,879	4,556
Short-term lease costs [1]	70	47	—
Sublease income	—	(55)	(957)
Total lease cost [2]	$ 4,572	$ 4,024	$ 3,826

[1] Short-term lease costs on leases with terms of over one month and less than one year.
[2] The Company had no variable lease costs.

Amounts included in measurement of lease obligations:

	Year Ended December 31,		
	2021	2020	2019
Cash paid:			
Operating cash flows from operating leases	$ 4,197	$ 2,816	$ 3,279
Operating cash flow from finance leases	$ —	$ 1	$ 10
Financing cash flows from finance leases	$ —	$ 60	$ 242
Non-cash activity:			
Operating Lease - Right-of-use assets obtained in exchange for lease liabilities	$ 25,445	$ —	$ 26,617
Finance Lease - Right-of-use assets obtained in exchange for lease liabilities	$ —	$ —	$ 493

	Operating Lease	Finance Lease
Other information:		
Weighted-average remaining lease term (in years)	7.9 years	—
Weighted-average discount rate	5.6 %	—

As of December 31, 2021, our maturity analysis of annual undiscounted cash flows of the non-cancellable operating leases are as follows (in thousands):

Years ending December 31,	Operating Leases
2022	$ 6,500
2023	7,571
2024	7,785
2025	8,007
2026	8,235
Thereafter	20,718
Total minimum lease payments	58,816
Less: imputed interest	11,162
Lease obligations	$ 47,654

Other Commitments

We enter into supply and service arrangements in the normal course of business. Supply arrangements are primarily for fixed-price manufacture and supply. Service agreements are primarily for the development of manufacturing processes and certain studies. Commitments under service agreements are subject to cancellation at our discretion which may require payment

of certain cancellation fees. The timing of completion of service arrangements is subject to variability in estimates of the time required to complete the work.

The following table provides quantitative data regarding our other commitments. Future minimum payments reflect amounts that we expect to pay including potential obligations under services agreements subject to risk of cancellation by us (in thousands):

Other Commitment Agreement Type	Agreement Date	Future Minimum Payment
Manufacture and supply agreement with expected future payment date of December 2022	April 2016	$ 101
Development and manufacturing services agreements	September 2019	2,469
Facility maintenance agreement	September 2021	1,475
Total other commitments		$ 4,045

Credit Facility

In June 30, 2017, we entered into a credit facility (the "Credit Facility") with Western Alliance Bank consisting of term loans (“Term Debt”) up to $10.0 million, and advances ("Advances") under a revolving line of credit ("Revolving Line of Credit") up to $5.0 million with an accounts receivable borrowing base of 80% of eligible accounts receivable. In September 2021, we entered into the Ninth Amendment to the Credit Facility whereby we may draw on the Term Debt and the Revolving Line of Credit at any time prior to December 31, 2021 and October 1, 2024, respectively. The right to take draws on the Term Debt expired on December 31, 2021 and no amounts were drawn under the Credit Facility as of December 31, 2021. On October 1, 2024, loans drawn under the Revolving Line of Credit terminate. Advances made under the Revolving Line of Credit bear interest at a variable annual rate equal to the equal to the greater of (i) 4.25% or (ii) the sum of (A) the prime rate plus (B) 1.00%.

Our obligations under the Credit Facility are secured by a lien on substantially all of our personal property other than our intellectual property. The Credit Facility includes a number of customary covenants and restrictive financial covenants including meeting minimum product revenue levels and maintaining certain minimum cash levels with the lender. The Credit Facility's financial covenants restrict the ability of the Company to transfer collateral, incur additional indebtedness, engage in mergers or acquisitions, pay dividends or make other distributions, make investments, create liens, sell assets, or sell certain assets held at foreign subsidiaries. A failure to comply with these covenants could permit the lender to exercise remedies against us and the collateral securing the Credit Facility, including foreclosure of our properties securing the Credit Facility and our cash. At December 31, 2021, we were in compliance with the covenants for the Credit Facility.

Legal Proceedings

We are not currently a party to any material pending litigation or other material legal proceedings.

Indemnifications

We are required to recognize a liability for the fair value of any obligations we assume upon the issuance of a guarantee. We have certain agreements with licensors, licensees and collaborators that contain indemnification provisions. In such provisions, we typically agree to indemnify the licensor, licensee and collaborator against certain types of third party claims. The maximum amount of the indemnifications is not limited. We accrue for known indemnification issues when a loss is probable and can be reasonably estimated. There were no accruals for expenses related to indemnification issues for any periods presented.

Note 14. Related Party Transactions

Molecular Assemblies, Inc.

In June 2020, we entered into a Stock Purchase Agreement with MAI pursuant to which we purchased 1,587,050 shares of MAI's Series A preferred stock for $1.0 million. In connection with the transaction, John Nicols, our President and Chief Executive Officer, also joined MAI’s board of directors. Concurrently with our initial equity investment, we entered into the MAI Agreement with MAI, pursuant to which we are performing services utilizing our CodeEvolver® protein engineering platform technology to improve DNA polymerase enzymes in exchange for compensation in the form of additional shares of MAI's Series A preferred stock. In April 2021, we purchased an additional 1,000,000 shares of MAI's Series A preferred stock for $0.6 million. In September 2021, we purchased 9,198,423 shares of MAI's Series B preferred stock for $7.0 million. In the

fourth quarter of 2021, we became eligible to receive the primary milestone payment of $1.0 million which we received in the form of additional of 1,587,049 Series B preferred stock during December 2021.

We recognized $2.0 million and $0.9 million in research and development revenue from transactions with MAI in the years ended December 31, 2021 and 2020, respectively. We received 3,491,505 and 714,171 shares of MAI's Series A and B preferred stock from research and development services we provided to MAI for the years ended December 31, 2021 and 2020, respectively. As of December 31, 2021, we have 16,705,320 shares of MAI's Series A and B preferred stock that we have earned or purchased since executing the Stock Purchase Agreement with MAI.

The carrying value of our investment in MAI Series A and B preferred stock was $12.7 million and $1.5 million at December 31, 2021 and 2020, respectively. We had $0.2 million and nil in deferred revenue as of December 31, 2021 and 2020, respectively, and nil and $0.5 million in contract assets due from MAI for services rendered as of December 31, 2021 and 2020, respectively. Payment for the services rendered was received in the form of additional Series A and Series B preferred stock. For additional information, see Note 5, "Collaborative Arrangements".

AstraZeneca PLC

Pam P. Cheng, who served as a member of our board of directors until June 2020, joined AstraZeneca PLC as Executive Vice President, Operations and Information Technology in June 2015. We sold biocatalyst products to AstraZeneca PLC and its controlled purchasing agents and contract manufacturers. We recognized $0.1 million of revenue in 2020, through the date of Ms. Cheng's departure from our board of directors. As of December 31, 2020, we had no receivables from AstraZeneca PLC and its controlled purchasing agents and contract manufacturers that was generated during the related party period.

Note 15. Segment, Geographical and Other Revenue Information

Segment Information

We manage our business as two business segments: Performance Enzymes and Novel Biotherapeutics. Our chief operating decision maker ("CODM") is our Chief Executive Officer. Our business segments are primarily based on our organizational structure and our operating results as used by our CODM in assessing performance and allocating resources for the Company.

We report corporate-related expenses such as legal, accounting, information technology, and other costs that are not otherwise included in our reportable business segments as "Corporate costs." All items not included in income (loss) from operations are excluded from the business segments.

We manage our assets on a total company basis, not by business segment, as the majority of our operating assets are shared or commingled. Our CODM does not review asset information by business segment in assessing performance or allocating resources, and accordingly, we do not report asset information by business segment.

Factors considered in determining the two reportable segments of the Company include the nature of business activities, the management structure directly accountable to our CODM for operating and administrative activities, availability of discrete financial information and information presented to the Board of Directors. Our CODM regularly reviews our segments and the approach provided by management for performance evaluation and resource allocation.

Operating expenses that directly support the segment activity are allocated based on segment headcount, revenue contribution or activity of the business units within the segments, based on the corporate activity type provided to the segment. The expense allocation excludes certain corporate costs that are separately managed from the segments. This provides the CODM with more meaningful segment profitability reporting to support operating decisions and allocate resources.

The following table provides financial information by our reportable business segments along with a reconciliation to consolidated loss before income taxes (in thousands):

	Year Ended December 31, 2021			Year Ended December 31, 2020		
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total
Revenues:						
Product revenue	$ 70,657	$ —	$ 70,657	$ 30,220	$ —	$ 30,220
Research and development revenue	19,858	14,239	34,097	17,886	20,950	38,836
Total revenues	90,515	14,239	104,754	48,106	20,950	69,056
Costs and operating expenses:						
Cost of product revenue	22,209	—	22,209	13,742	—	13,742
Research and development [1]	23,140	30,219	53,359	20,923	21,705	42,628
Selling, general and administrative[1]	12,105	2,755	14,860	9,597	2,355	11,952
Total segment costs and operating expenses	57,454	32,974	90,428	44,262	24,060	68,322
Income (loss) from operations	$ 33,061	$ (18,735)	14,326	$ 3,844	$ (3,110)	734
Corporate costs [2]			(32,201)			(22,306)
Depreciation and amortization			(3,215)			(2,099)
Loss before income taxes			$ (21,090)			$ (23,671)

[1] Research and development expenses and selling, general and administrative expenses exclude depreciation and amortization of finance leases.

[2] Corporate costs include unallocated selling, general and administrative expense, interest income, and other income (expense), net.

	Year Ended December 31, 2020			Year Ended December 31, 2019		
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total
Revenues:						
Product revenue	$ 30,220	$ —	$ 30,220	$ 29,465	$ —	$ 29,465
Research and development revenue	17,886	20,950	38,836	28,691	10,302	38,993
Total revenues	48,106	20,950	69,056	58,156	10,302	68,458
Costs and operating expenses:						
Cost of product revenue	13,742	—	13,742	15,632	—	15,632
Research and development [1]	20,923	21,705	42,628	19,380	13,278	32,658
Selling, general and administrative[1]	9,597	2,355	11,952	8,462	2,222	10,684
Total segment costs and operating expenses	44,262	24,060	68,322	43,474	15,500	58,974
Income (loss) from operations	$ 3,844	$ (3,110)	734	$ 14,682	$ (5,198)	9,484
Corporate costs [2]			(22,306)			(19,624)
Depreciation and amortization			(2,099)			(1,778)
Loss before income taxes			$ (23,671)			$ (11,918)

[1] For the years ended December 31, 2020 and 2019, research and development expenses and selling, general and administrative expenses exclude depreciation and amortization of finance leases.

[2] Corporate costs include unallocated selling, general and administrative expense, interest income, and other income (expense), net.

The following table provides stock-based compensation expense included in income (loss) from operations (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Performance Enzymes	$ 4,514	$ 2,970	$ 2,303
Novel Biotherapeutics	1,100	768	695
Corporate cost	5,979	3,990	3,945
Total	$ 11,593	$ 7,728	$ 6,943

Significant Customers

Customers that each accounted for 10% or more of our total revenues were as follows:

	Percentage of Total Revenues For the Year Ended December 31,		
	2021	2020	2019
Customer A	33 %	*	*
Customer B	11 %	26 %	28 %
Customer C	*	19 %	*
Customer D	*	11 %	15 %
Customer E	*	*	23 %

** Percentage was less than 10%*

Customers that each accounted for 10% or more of accounts receivable balances as of the periods presented as follows:

	As of December 31,	
	2021	2020
Customer A	62 %	*
Customer B	*	32 %
Customer D	*	13 %
Customer E	*	25 %

** Percentage was less than 10%*

Geographical Information

Geographic revenues are identified by the location of the customer and consist of the following (in thousands):

	Year Ended December 31,		
	2021	2020	2019
Revenues			
Americas	$ 23,481	$ 24,352	$ 13,039
EMEA	20,187	19,257	37,133
APAC	61,086	25,447	18,286
Total revenues	$ 104,754	$ 69,056	$ 68,458

Identifiable long-lived assets by location were as follows (in thousands):

	December 31,	
	2021	2020
United States	$ 65,457	$ 31,176

Identifiable goodwill was as follows (in thousands):`

	December 31, 2021			December 31, 2020		
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total
Goodwill	$ 2,463	$ 778	$ 3,241	$ 2,463	$ 778	$ 3,241

Note 16. Allowance for Credit Losses

The following summarizes the receivables allowance for credit losses (in thousands):

	December 31,		
	2021	2020	2019
Balance at beginning of period	$ 74	$ 34	$ 34
Provision for credit losses	342	40	—
Balance at end of period	$ 416	$ 74	$ 34

The following tables below summarizes accounts receivable by aging category (in thousands):

	December 31, 2021					
	31-60 Days	61-90 Days	91 Days and over	Total over 31 Days	Current	Total balance
Accounts receivable	$ 536	$ 569	$ 1,151	$ 2,256	$ 22,697	$ 24,953

	December 31, 2020					
	31-60 Days	61-90 Days	91 Days and over	Total over 31 Days	Current	Total balance
Accounts receivable	$ 489	$ 7	$ —	$ 496	$ 13,398	$ 13,894

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURES

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, under the supervision of our Chief Executive Officer and Chief Financial Officer and with the participation of our disclosure committee, evaluated the effectiveness of the design and operation of our disclosure controls and procedures as of December 31, 2021. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure. Based on this evaluation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of December 31, 2021 at the reasonable assurance level.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external reporting purposes in accordance with United States generally accepted accounting principles.

Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting as of December 31, 2021 based on the guidelines established in *Internal Control-Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). Based on the results of our evaluation, our management concluded that our internal control over financial reporting was effective as of December 31, 2021. We reviewed the results of management's assessment with our Audit Committee.

Our internal control over financial reporting as of December 31, 2021 has been audited by BDO USA, LLP, an independent registered public accounting firm, as stated in their report which is included in Item 8 of this Annual Report.

Inherent Limitations on Effectiveness of Controls

In designing and evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, even if determined effective and no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives to prevent or detect misstatements. In addition, the design of disclosure controls and procedures must reflect the fact that there are resource constraints and that management is required to apply judgment in evaluating the benefits of possible controls and procedures relative to their costs. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting (as defined in Rule 13a-15(f) of the Exchange Act) identified in connection with the evaluation required by paragraph (d) of Rule 13a-15 or 15d-15 of the Exchange Act, which occurred during the fourth fiscal quarter of the year ended December 31, 2021, which has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

Not applicable.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information required by this item concerning our directors, executive officers, compliance with Section 16 of the Exchange Act, our code of ethics and our Nominating and Corporate Governance Committee, and our Audit Committee is incorporated by reference from the information that will be set forth in the sections under the headings "Election of Directors," "Other Matters—Section 16(a) Beneficial Ownership Reporting Compliance" and "Corporate Governance Matters" in the 2022 Proxy Statement.

ITEM 11. EXECUTIVE COMPENSATION

The information required by this item concerning executive compensation is incorporated by reference from the information that will be set forth in the 2022 Proxy Statement under the headings "Executive Compensation," and "Corporate Governance Matters."

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information required by this item concerning securities authorized for issuance under equity compensation plans and security ownership of certain beneficial owners and management is incorporated by reference from the information that will be set forth in the 2022 Proxy Statement under the headings "Executive Compensation—Equity Compensation Plan Information" and "Information Concerning Voting and Solicitation—Security Ownership of Certain Beneficial Owners and Management."

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information required by this item concerning transactions with related persons and director independence is incorporated by reference from the information that will be set forth in the 2022 Proxy Statement under the headings "Certain Relationships and Related Transactions" and "Corporate Governance Matters."

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The information required by this item is incorporated by reference from the information that will be set forth in the 2022 Proxy Statement under the heading "Ratification of Independent Registered Public Accounting Firm—Principal Accounting Fees and Services."

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

1. Financial Statements: See “Index to Consolidated Financial Statements” in Part II, Item 8 of this Annual Report on Form 10-K

2. Exhibits: The exhibits listed in the accompanying index to exhibits are filed or incorporated by reference as part of this Annual Report on Form 10-K.

EXHIBIT INDEX

Exhibit No.	Description
3.1	Amended and Restated Certificate of Incorporation of Codexis, Inc. filed with the Secretary of the State of the State of Delaware on April 27, 2010 and effective as of April 27, 2010 (incorporated by reference to Exhibit 3.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2010, filed on May 28, 2010).
3.2	Certificate of Designations of Series A Junior Participating Preferred Stock of Codexis, Inc., filed with the Secretary of State of the State of Delaware on September 4, 2012 (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K, filed on September 4, 2012).
3.3	Amended and Restated Bylaws of Codexis, Inc. effective as of April 27, 2010 (incorporated by reference to Exhibit 3.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2010, filed on May 28, 2010).
4.1	Reference is made to Exhibits 3.1 through 3.3.
4.2	Form of the Company's Common Stock Certificate (incorporated by reference to Exhibit 4.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2012, filed on August 9, 2012).
4.3	Description of Codexis' Securities Registered Pursuant to Section 12 of the Securities Exchange Act of 1934
10.1A*	Lease Agreement by and between the Company and Metropolitan Life Insurance Company dated as of February 1, 2004.
10.1B*	Amendment to Lease Agreement by and between the Company and Metropolitan Life Insurance Company dated as of June 1, 2004.
10.1C*	Amendment to Lease Agreement by and between the Company and Metropolitan Life Insurance Company dated as of March 9, 2007.
10.1D*	Amendment to Lease Agreement by and between the Company and Metropolitan Life Insurance Company dated as of March 31, 2008.
10.1E	Fourth Amendment to Lease Agreement by and between the Company and Metropolitan Life Insurance Company dated as of September 17, 2010 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2010, filed on November 4, 2010).
10.1F	Fifth Amendment to Lease Agreement by and between the Company and Metropolitan Life Insurance Company dated as of March 16, 2011 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2011, filed on May 6, 2011).
10.1G	Sixth Amendment to Lease by and between the Company and Metropolitan Life Insurance Company dated as of September 27, 2012 (incorporated by reference to Exhibit 10.6 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2012, filed on November 7, 2012).
10.1H	Seventh Amendment to Lease by and between the Company and Metropolitan Life Insurance Company dated as of October 11, 2016 (incorporated by reference to Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2016, filed on November 8, 2016).

Exhibit No.	Description
10.1I***	Eighth Amendment to Lease, dated as of February 8, 2019, by and between the Company and Metropolitan Life Insurance Company (incorporated by reference to Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2019, filed on May 8, 2019).
10.2+*	Codexis, Inc. 2010 Equity Incentive Award Plan and Form of Stock Option Agreement.
10.3A+	Codexis, Inc. 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.1 to the Company's Registration Statement on Form S-8 (File No. 333-232262) filed with the SEC on June 21, 2019).
10.3B+	Form of Restricted Stock Unit Award Grant Notice and Restricted Stock Unit Award Agreement under 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.2 to the Company's Registration Statement on Form S-8 (File No. 333-232262) filed with the SEC on June 21, 2019).
10.3C+	Form of Stock Option Grant Notice and Stock Option Agreement under 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.3 to the Company's Registration Statement on Form S-8 (File No. 333-232262) filed with the SEC on June 21, 2019).
10.3D+	Form of Stock Option Grant Notice and Stock Option Agreement under 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.4 to the Company's Registration Statement on Form S-8 (File No. 333-232262) filed with the SEC on June 21, 2019).
10.3E+	Form of Performance Stock Unit Award Grant Notice and Performance Stock Unit Award Agreement under 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.5 to the Company's Registration Statement on Form S-8 (File No. 333-232262) filed with the SEC on June 21, 2019).
10.3F+	Form of Restricted Stock Award Grant Notice and Restricted Stock Award Agreement under 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.6 to the Company's Registration Statement on Form S-8 (File No. 333-232262) filed with the SEC on June 21, 2019).
10.4*	Form of Indemnification Agreement between the Company and each of its directors, officers and certain employees.
10.5+	Form of Amended and Restated Change in Control Severance Agreement between the Company and certain of its officers (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2019, filed on November 6, 2019).
10.6	Asset Purchase Agreement, dated October 28, 2010, by and among the Company, Codexis Mayflower Holdings, LLC and Maxygen, Inc. (incorporated by reference to Exhibit 2.1 to the Company's Current Report on Form 8-K, filed on October 28, 2010).
10.7A†	Manufacture and Supply Agreement, dated May 16, 2011, by and between the Company and Lactosan GmbH & Co. KG (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2011, filed on August 3, 2011).
10.7B	Amendment No. 1 to the Manufacture and Supply Agreement by and between the Company and Lactosan GmbH & Co. KG dated as of March 9, 2012 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2012, filed on May 10, 2012).
10.8+	Employment Agreement by and between the Company and Ross Taylor effective as of August 4, 2019 (incorporated by reference to Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2019, filed on November 6, 2019).
10.9A+	Employment Agreement by and between the Company and John Nicols effective as of May 28, 2012 (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2012, filed on August 9, 2012).

Exhibit No.	Description
10.9B+	John Nicols Stock Option Grant Notice and Stock Option Agreement dated June 13, 2012 between John J. Nicols and the Company (incorporated by reference to Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2012, filed on August 9, 2012).
10.9C+	Amendment to Employment Agreement between the Company and John Nicols, dated April 21, 2016 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2016, filed on August 9, 2016).
10.9D+	Amendment to Employment Agreement between the Company and John Nicols, dated November 16, 2017 (incorporated by reference to Exhibit 10.8E to the Company's Annual Report on Form 10-K for the year ended December 31, 2017, filed on March 15, 2018).
10.9E+	Amendment to Employment Agreement between the Company and John Nicols, effective as of June 28, 2019, (incorporated by reference to Exhibit 10.4 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2019, filed on November 6, 2019).
10.10A†	Sitagliptin Catalyst Supply Agreement by and between Merck Sharp and Dohme Corp. and the Company dated as of February 1, 2012 (incorporated by reference to Exhibit 10.25 to the Company's Annual Report on Form 10-K for the year ended December 31, 2012, filed on April 2, 2013).
10.10B†	Amendment to Sitagliptin Catalyst Supply Agreement between Merck Sharp and Dohme Corp. and the Company dated as of October 1, 2013 (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2013, filed on November 12, 2013).
10.10C	Amendment No. 2 to Sitagliptin Catalyst Supply Agreement between Merck Sharp and Dohme Corp. and the Company dated as of February 25, 2015 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2015, filed on May 7, 2015).
10.10D	Amendment No. 3 to Sitagliptin Catalysts Supply Agreement between Merck Sharp and Dohme Corp. and the Company dated as of December 17, 2015 (incorporated by reference to Exhibit 10.11D to the Company's Annual Report on Form 10-K for the year ended December 31, 2015, filed on March 8, 2016).
10.10E	Amendment No. 4 to Sitagliptin Catalysts Supply Agreement, effective as of January 1, 2016, by and between the Company and Merck Sharp and Dohme Corp. (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2016, filed on November 8, 2016).
10.10F	Amendment No. 5 to Sitagliptin Catalysts Supply Agreement, effective as of July 1, 2021, by and between the Company and Merck Sharp and Dohme Corp. (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2021, filed on November 5, 2021).
10.11A†	Global Development, Option and License Agreement by and among the Company, Societé des Produits Nestlé S.A., formerly known as Nestec Ltd. ("Nestlé Health Science"), effective as of October 12, 2017 (incorporated by reference to Exhibit 10.10 to the Company's Annual Report on Form 10-K for the year ended December 31, 2017, filed on March 15, 2018).
10.11B†	Amendment No. 1 to Global Development, Option and License Agreement by and among the Company, Nestec Ltd. and Nestlé Amendment No. 1 to Global Development, Option and License Agreement by and among the Company, Nestec Ltd. and Nestlé Health Science S.A., effective as of July 26, 2018.(incorporated by reference to Exhibit 10.12B to the Company's Annual Report on Form 10-K for the year ended December 31, 2018, filed on March 3, 2019). Science S.A., effective as of July 26, 2018.
10.11C†	Letter Agreement to Global Development, Option and License Agreement by and among the Company, Nestec Ltd. and Nestlé Health Science S.A., effective as of December 12, 2018. (incorporated by reference to Exhibit 10.12C to the Company's Annual Report on Form 10-K for the year ended December 31, 2018, filed on March 3, 2019).

Exhibit No.	Description
10.12A†	Platform Technology Transfer, Collaboration and License Agreement by and between the Company and GlaxoSmithKline Intellectual Property Limited, effective as of July 10, 2014 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 31, 2014, filed on November 6, 2014).
10.12B†	Letter Agreement, effective as of February 21, 2020, by and between Codexis, Inc. and GlaxoSmithKline Intellectual Property Development Limited (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2020, filed on May 8, 2020).
10.13A***	Platform Technology Transfer and License Agreement by and between the Company and Merck Sharp & Dohme Corp., dated as of August 3, 2015.
10.13B†	Amendment No. 1 to Platform Technology Transfer and License Agreement by and between the Company and Merck Sharp & Dohme Corp., dated as of October 10, 2018, incorporated by reference to Exhibit 10.14A to the Company's Annual Report on Form 10-K for the year ended December 31, 2018, filed on March 3, 2019).
10.13C***	Amendment No. 2 to Platform Technology Transfer and License Agreement by and between Merck and the Company dated as of January 1, 2019 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2019, filed on May 8, 2019).
10.14***	Platform Technology Transfer and License Agreement, dated May 2, 2019, by and between the Company and Novartis Pharma AG (incorporated by reference to Exhibit 10.4 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2019, filed on August 6, 2019).
10.15***	Strategic Collaboration and License Agreement by and between Shire Human Genetic Therapies, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited and the Company, dated March 23, 2020 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2020, filed on May 8, 2020).
10.16A†	Loan and Security Agreement effective as of June 30, 2017 by and between the Company and Western Alliance Bank (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2017, filed on August 9, 2017).
10.16B†	First Amendment to Loan and Security Agreement effective as of September 28, 2017 by and between the Company and Western Alliance Bank (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2017, filed on November 9, 2017).
10.16C†	Second Amendment to Loan and Security Agreement effective as of November 7, 2017 by and between the Company and Western Alliance Bank (incorporated by reference to Exhibit 10.15B to the Company's Annual Report on Form 10-K for the year ended December 31, 2017, filed on March 15, 2018).
10.16D†	Third Amendment to Loan and Security Agreement by and between the Company and Western Alliance Bank dated as of June 29, 2018 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2018, filed on August 9, 2018).
10.16E†	Fourth Amendment to Loan and Security Agreement effective as of September 28, 2018 by and between the Company and Western Alliance Bank (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2018, filed on November 9, 2018).
10.16F	Fifth Amendment to Loan and Security Agreement effective as of January 23, 2019 by and between the Company and Western Alliance Bank (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2019, filed on May 8, 2019).

Exhibit No.	Description
10.16G	Sixth Amendment to Loan and Security Agreement by and between the Company and Western Alliance Bank dated as of July 11, 2019 (incorporated by reference to Exhibit 10.1A to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2019, filed on November 6, 2019).
10.16H	Seventh Amendment to Loan and Security Agreement by and between the Company and Western Alliance Bank dated as of September 30, 2019 (incorporated by reference to Exhibit 10.1B to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2019, filed on November 6, 2019).
10.16I	Eighth Amendment to Loan and Security Agreement by and between the Company and Western Alliance Bank dated as of September 30, 2020 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2020, filed on November 6, 2020.)
10.16J	Ninth Amendment to Loan and Security Agreement by and between the Company and Western Alliance Bank dated as of September 30, 2021 (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended September 30, 2021, filed on November 5, 2021).
10.17	Lease Agreement by and between the Company and ARE-SAN FRANCISCO NO. 63, LLC dated as of January 29, 2021 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2021, filed on May 7, 2021).
23.1	Consent of BDO USA, LLP, independent registered public accounting firm.
24.1	Power of Attorney (see signature page to this Annual Report on Form 10-K).
31.1	Certification of Principal Executive Officer Required Under Rule 13a-14(a) and 15d-14(a) of the Securities Exchange Act of 1934, as amended.
31.2	Certification of Principal Financial Officer Required Under Rule 13a-14(a) and 15d-14(a) of the Securities Exchange Act of 1934, as amended.
32.1**	Certification of Principal Executive Officer and Principal Financial Officer Required Under Rule 13a-14(b) of the Securities Exchange Act of 1934, as amended, and 18 U.S.C. §1350.
101	The following materials from Registrant's Annual Report on Form 10-K for the fiscal year ended December 31, 2021 formatted in Inline Extensible Business Reporting Language (iXBRL) includes: (i) Consolidated Balance Sheets at December 31, 2021 and December 31, 2020, (ii) Consolidated Statements of Operations for the years ended December 31, 2021, December 31, 2020 and December 31, 2019, (iii) Consolidated Statements of Cash Flows for the years ended December 31, 2021, December 31, 2020 and December 31, 2019, (vi) Consolidated Statements of Stockholders' Equity for the years ended December 31, 2021, December 31, 2020 and December 31, 2019 and (vii) Notes to Consolidated Financial Statements.
101.SCH	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document

Exhibit No.	Description
104	The cover page from the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2021, formatted in Inline XBRL and contained in Exhibit 101.

+ Indicates a management contract or compensatory plan or arrangement.

† Confidential treatment has been granted for certain information contained in this exhibit. Such information has been omitted and filed separately with the Securities and Exchange Commission.

* Filed as exhibits to the registrant's Registration Statement on Form S-1 (File No. 333-164044), effective April 21, 2010, and incorporated herein by reference.

** Pursuant to Item 601(b)(32) of Regulation S-K this exhibit is furnished rather than filed with this report.

*** Portions of the exhibit, marked by brackets, have been omitted because the omitted information is (i) not material and (ii) would be competitively harmful if publicly disclosed.

ITEM 16. FORM 10-K SUMMARY

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

CODEXIS, INC.

Date: February 28, 2022

By: /s/ John J. Nicols
President and Chief Executive Officer
(Principal Executive Officer)

POWER OF ATTORNEY

Each person whose individual signature appears below hereby authorizes and appoints John J. Nicols, Ross Taylor and Richard A. Sabalot, and each of them, with full power of substitution and resubstitution and full power to act without the other, as his or her true and lawful attorney-in-fact and agent to act in his or her name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this annual report on Form 10-K and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

SIGNATURE	TITLE		DATE
/s/ John J. Nicols John J. Nicols	President, Chief Executive Officer and Director (Principal Executive Officer)	Date:	February 28, 2022
/s/ Ross Taylor Ross Taylor	Senior Vice President and Chief Financial Officer (Principal Financial and Accounting Officer)	Date:	February 28, 2022
/s/ Byron L. Dorgan Byron L. Dorgan	Chairman of the Board of Directors	Date:	February 28, 2022
/s/ Jennifer Aaker Jennifer Aaker	Director	Date:	February 28, 2022
/s/ Stephen Dilly Stephen Dilly	Director	Date:	February 28, 2022
/s/ Esther Martinborough Esther Martinborough	Director	Date:	February 28, 2022
/s/ Alison Moore Alison Moore	Director	Date:	February 28, 2022
/s/ David V. Smith David V. Smith	Director	Date:	February 28, 2022
/s/ Dennis P. Wolf Dennis P. Wolf	Director	Date:	February 28, 2022
/s/ Patrick Y. Yang Patrick Y. Yang	Director	Date:	February 28, 2022

Exhibit 4.3

DESCRIPTION OF THE REGISTRANT'S SECURITIES REGISTERED PURSUANT TO SECTION 12 OF THE SECURITIES EXCHANGE ACT OF 1934

As of February 28, 2022, Codexis, Inc. ("we," "us" or "our") had one class of securities registered under Section 12 of the Securities Exchange Act of 1934, as amended: our common stock, $0.0001 par value per share ("common stock").

Description of Common Stock

The following description of our common stock is a summary and does not purport to be complete. It is subject to and qualified in its entirety by reference to our amended and restated certificate of incorporation, our certificate of designations of Series A Junior Participating Preferred Stock and our amended and restated bylaws, each of which are incorporated by reference as an exhibit to the Annual Report on Form 10-K of which this Exhibit 4.3 is a part. We encourage you to read our amended and restated certificate of incorporation, our certificate of designations of Series A Junior Participating Preferred Stock, our amended and restated bylaws and the applicable provisions of the Delaware General Corporation Law for additional information.

Authorized Capital Stock

Our authorized capital stock consists of:

- 100,000,000 shares of common stock; and
- 5,000,000 shares of preferred stock, $0.0001 par value per share, of which 100,000 shares have been designated as Series A Junior Participating Preferred Stock.

Voting Rights

Each holder of our common stock is entitled to one vote for each share on all matters submitted to a vote of the stockholders, including the election of directors. Our stockholders do not have cumulative voting rights in the election of directors. Accordingly, holders of a majority of the voting shares are able to elect all of the directors. In addition, the affirmative vote of holders of 66 2/3% of the voting power of all of the then outstanding voting stock will be required to take certain actions, including amending certain provisions of our amended and restated certificate of incorporation, such as the provisions relating to amending our amended and restated bylaws, the classified board and director liability.

Dividends

Subject to preferences that may be applicable to any then outstanding preferred stock, holders of our common stock are entitled to receive dividends, if any, as may be declared from time to time by our board of directors out of legally available funds.

Liquidation

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of our debts and other liabilities and the satisfaction of any liquidation preference granted to the holders of any then outstanding shares of preferred stock.

Rights and Preferences

Holders of our common stock have no preemptive, conversion, subscription or other rights, and there are no redemption or sinking fund provisions applicable to our common stock. The rights, preferences and privileges of the holders of our common stock are subject to and may be adversely affected by the rights of the holders of shares of any series of our preferred stock that we may designate in the future.

Preferred Stock – Limitations on Rights of Holders of Common Stock

Our board of directors has the authority, without further action by our stockholders, to issue up to 5,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights,

terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon our liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action.

Anti-Takeover Effects of Provisions of our Amended and Restated Certificate of Incorporation, our Amended and Restated Bylaws and Delaware Law

Some provisions of Delaware law and our amended and restated certificate of incorporation and our amended and restated bylaws contain provisions that could make the following transactions more difficult: acquisition of us by means of a tender offer; acquisition of us by means of a proxy contest or otherwise; or removal of our incumbent officers and directors. It is possible that these provisions could make it more difficult to accomplish or could deter transactions that stockholders may otherwise consider to be in their best interest or in our best interests, including transactions that might result in a premium over the market price for our shares.

These provisions, summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of us to first negotiate with our board of directors. We believe that the benefits of increased protection of our potential ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure us outweigh the disadvantages of discouraging these proposals because negotiation of these proposals could result in an improvement of their terms.

Delaware Anti-Takeover Statute

We are subject to the provisions of Section 203 of the Delaware General Corporation Law. Under Section 203, we would generally be prohibited from engaging in any business combination with any interested stockholder for a period of three years following the time that this stockholder became an interested stockholder unless:

- prior to this time, the board of directors of the corporation approved either the business combination or the transaction that resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding shares owned by persons who are directors and also officers, and by employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- at or subsequent to such time, the business combination is approved by the board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least 66 2/3% of the outstanding voting stock that is not owned by the interested stockholder.

Under Section 203, a “business combination” includes:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, pledge or other disposition of 10% or more of the assets of the corporation involving the interested stockholder;
- any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder, subject to limited exceptions;
- any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; or
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as an entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by such entity or person.

Undesignated Preferred Stock

The ability to authorize undesignated preferred stock makes it possible for our board of directors to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change control of us. These and other provisions may have the effect of deterring hostile takeovers or delaying changes in control or management of our company.

Special Stockholder Meetings

Our charter documents provide that a special meeting of stockholders may be called only by our chairman of the board of directors, Chief Executive Officer or President, or by a resolution adopted by a majority of our board of directors.

Requirements for Advance Notification of Stockholder Nominations and Proposals

Our amended and restated bylaws establish advance notice procedures with respect to stockholder proposals and the nomination of candidates for election as directors, other than nominations made by or at the direction of the board of directors or a committee of the board of directors.

Elimination of Stockholder Action by Written Consent

Our amended and restated certificate of incorporation eliminates the right of stockholders to act by written consent without a meeting.

Classified Board; Election and Removal of Directors; Filling Vacancies

Our board of directors is divided into three classes. The directors in each class will serve for a three-year term, one class being elected each year by our stockholders, with staggered three-year terms. Only one class of directors will be elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms. Because our stockholders do not have cumulative voting rights, our stockholders holding a majority of the shares of common stock outstanding will be able to elect all of our directors. Our amended and restated certificate of incorporation provides for the removal of any of our directors only for cause and requires a stockholder vote by the holders of at least a 66 2/3% of the voting power of the then outstanding voting stock. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of the board of directors, may only be filled by a resolution of the board of directors unless the board of directors determines that such vacancies shall be filled by the stockholders. This system of electing and removing directors and filling vacancies may tend to discourage a third party from making a tender offer or otherwise attempting to obtain control of us, because it generally makes it more difficult for stockholders to replace a majority of the directors.

Amendment of Charter Provisions

The amendment of any of the above provisions, except for the provision making it possible for our board of directors to issue preferred stock, would require approval by holders of at least 66-2/3% of the voting power of our then outstanding voting stock.

The provisions of the Delaware General Corporation Law, our amended and restated certificate of incorporation and our amended and restated bylaws could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they may also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions may also have the effect of preventing changes in our management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders may otherwise deem to be in their best interests.

Limitations of Liability and Indemnification Matters

Our amended and restated certificate of incorporation contains provisions that limit the liability of our directors for monetary damages to the fullest extent permitted by Delaware law. Consequently, our directors will not be personally liable to us or our stockholders for monetary damages for any breach of fiduciary duties as directors, except liability for:

- any breach of the director's duty of loyalty to us or our stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- unlawful payments of dividends or unlawful stock repurchases or redemptions as provided in Section 174 of the Delaware General Corporation Law; or
- any transaction from which the director derived an improper personal benefit.

Our amended and restated certificate of incorporation provides that we may, and our amended and restated bylaws provide that we are required to, indemnify our directors and officers, in each case to the fullest extent permitted by Delaware law. Our amended and restated bylaws also provide that we shall advance expenses incurred by a director or officer in advance of the final disposition of any action or proceeding, and permit us to secure insurance on behalf of any officer, director, employee or other agent for any liability arising out of his or her actions in that capacity regardless of whether we would otherwise be permitted to indemnify him or her under Delaware law. We have entered and expect to continue to enter into agreements to indemnify our directors, executive officers and other employees as determined by our board of directors. With specified exceptions, these agreements provide for indemnification for related expenses including, among other things, attorneys' fees, judgments, fines and settlement amounts incurred by any of these individuals in any action or proceeding. We believe that these bylaw provisions and indemnification agreements are necessary to attract and retain qualified persons as directors and officers. We also maintain directors' and officers' liability insurance.

The limitation of liability and indemnification provisions in our amended and restated certificate of incorporation and amended and restated bylaws may discourage stockholders from bringing a lawsuit against our directors and officers for breach of their fiduciary duty. They may also reduce the likelihood of derivative litigation against our directors and officers, even though an action, if successful, might benefit us and our stockholders. Further, a stockholder's investment may be adversely affected to the extent that we pay the costs of settlement and damage.

The Nasdaq Global Select Market Listing

Our common stock is listed on The Nasdaq Global Select Market under the symbol "CDXS."

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is EQ Shareowner Services.

[***] Certain information in this document, indicated by brackets, has been excluded pursuant to Regulation S-K, Item 601(b)(10)(iv). Such excluded information is not material and would likely cause competitive harm to the registrant if publicly disclosed.

Exhibit 10.13A

PLATFORM TECHNOLOGY TRANSFER AND LICENSE AGREEMENT

THIS PLATFORM TECHNOLOGY TRANSFER AND LICENSE AGREEMENT (together with any exhibits attached hereto, this "**Agreement**") is made and entered into as of August 3, 2015 (the "**Effective Date**"), by and between Codexis, Inc., a corporation organized and existing under the laws of Delaware ("**Codexis**"), and Merck Sharp & Dohme Corp., a corporation organized and existing under the laws of New Jersey ("**Merck**"). Codexis and Merck are sometimes referred to herein individually as a "**Party**" and collectively as the "**Parties.**"

RECITALS

WHEREAS, Codexis possesses expertise in the engineering and optimization of biocatalysts for use in pharmaceutical compound synthesis and manufacture;

WHEREAS, Merck seeks to develop biocatalytic approaches to synthesize compounds of interest to Merck and to practice the Platform Technology under the licenses granted by Codexis and in connection with a technology transfer from Codexis; and

WHEREAS, Codexis desires to grant to Merck such license and perform such technology transfer, on the terms and conditions set forth herein.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises and the mutual promises, covenants and conditions contained in this Agreement, the Parties agree as follows:

1. DEFINITIONS. The terms in this Agreement with initial letters capitalized, whether used in the singular or the plural, shall have the meaning set forth below.

1.1 "**Additional Services**" means any enzyme evolution related services performed by Codexis pursuant to Section 4.2 of this Agreement.

1.2 "**Affiliate**" means any Person that directly or indirectly is controlled by, controls or is under common control with a Party to this Agreement. For the purposes of this definition, the term "control" (including, with correlative meanings, the terms "controlled by" and "under common control with") as used with respect to a Person means (a) in the case of a corporate entity, direct or indirect ownership of voting securities entitled to cast more than fifty percent (50%) of the votes in the election of directors, (b) in the case of a non-corporate entity, direct or indirect ownership of more than fifty percent (50%) of the equity interests with the power to direct the management and policies

of such entity, or (c) any other arrangement whereby a Person controls or has the right to control the board of directors or equivalent governing body or management of a corporation or other entity; *provided* that, if local Applicable Law restricts foreign ownership, control shall be established by direct or indirect ownership of the maximum ownership percentage that may, under such local Applicable Law, be owned by foreign interests.

1.3 "**Agreement Payments**" means all amounts, fees, royalties, and other payments made by Merck to Codexis under this Agreement.

1.4 "**Applicable Law**" means all applicable laws, statutes, rules, regulations, ordinances and other pronouncements having the effect of law of any federal, national, multinational, state, provincial, county, city or other political subdivision, government or Regulatory Authority.

1.5 "**Approved Server**" means physical or virtual computer server(s) that are (i) required for the operation of the Codexis Software, (ii) controlled by Merck or its designated Third Party cloud service provider, and (iii) meet all hardware specifications, software specifications, and other specifications and requirements specified by Codexis for the proper operation of the Codexis Software.

1.6 "**Arising Codexis Enzyme Technology**" means: (a) the amino acid sequence and structure of any Covered Enzyme or Enzyme developed under any of a Technology Transfer Project or an Evolution Program or during Additional Services and (b) structure activity data that describes the structure activity relationship and other characteristics of any Covered Enzyme(s) or Enzyme(s) noted in (a), and in each of (a) and (b), which data and information are Controlled by Codexis. For the avoidance of doubt, Arising Codexis Enzyme Technology shall not include any of the foregoing (a) or (b) developed outside of a Technology Transfer Project or an Evolution Program or during Additional Services.

1.7 "**Arising Codexis Enzyme Technology IP**" means Intellectual Property Rights which have arisen directly from the Arising Codexis Enzyme Technology. For clarity, the Arising Codexis Enzyme Technology IP excludes any Background IP of Merck, any Arising Merck Process Technology IP, any Arising Merck Enzyme Technology IP, and any Merck API Process Technology IP.

1.8 "**Arising Codexis Process Technology**" means methods of using Covered Enzyme(s) or Enzyme(s) in compound synthesis, developed under either a Technology Transfer Project or an Evolution Program or during Additional Services and which methods are Controlled by Codexis; *provided* that Arising Codexis Process Technology shall exclude technology that is

generally applicable to chemical process development and to the synthesis and scale-up of small molecule compounds and that does not specifically require the use or performance of such Covered Enzyme or Enzyme.

1.9 "**Arising Codexis Process Technology IP**" means Intellectual Property Rights which have arisen directly from the Arising Codexis Process Technology. For clarity, the Arising Codexis Process Technology IP excludes any Background IP of Merck, any Arising Merck Process Technology IP, any Arising Merck Enzyme Technology IP, and any Merck API Process Technology IP.

1.10 "**Arising Merck Enzyme Technology**" means the Technology related to any Covered Enzyme or Enzyme created, developed, or invented solely by Merck. For clarity, no Covered Enzyme or Enzyme created, developed, or invented during a Technology Transfer Program or an Evolution Program or Additional Services will be deemed to have been solely developed by Merck.

1.11 "**Arising Merck Enzyme Technology IP**" means Intellectual Property Rights which have arisen directly from the Arising Merck Enzyme Technology. For clarity the Arising Merck Enzyme Technology IP excludes any Background IP of Codexis, any Arising Codexis Process Technology IP and any Arising Codexis Enzyme Technology IP.

1.12 "**Arising Merck Process Technology**" means any Process Technology that is created, developed, or invented solely by Merck or jointly by Merck and Codexis.

1.13 **"Arising Merck Process Technology IP**" means Intellectual Property Rights which have arisen directly from the Arising Merck Process Technology. For clarity, the Arising Merck Process Technology IP excludes any Background IP of Codexis, any Arising Codexis Process Technology IP, any Arising Codexis Enzyme Technology IP and any Arising Merck Enzyme Technology IP.

1.14 "**Background IP**" means any and all Intellectual Property Rights which are Controlled by a Party and (a) exist as of the Effective Date and/or (b) arise during the Term independently of the other Party and this Agreement.

1.15 "**Business Day**" means a day other than Saturday, Sunday or any day on which commercial banks located in New York, New York are authorized or obligated by Applicable Law to close.

1.16 "**Calendar Quarter**" means the period beginning on the Effective Date and ending on the last day of the calendar quarter in which the Effective Date falls and, thereafter, each successive period of three (3) consecutive calendar months ending on March 31, June 30, September 30 or December 31.

1.17 "**Calendar Year**" means the period beginning on the Effective Date and ending on December 31st of the calendar year in which the Effective Date falls, and thereafter, each successive period of twelve (12) consecutive calendar months commencing on January 1 and ending on December 31.

1.18 "**Claim**" means any claim, demand, cause of action, suit, dispute, proceeding, arbitration, audit, hearing, investigation or inquiry (whether formal or informal).

1.19 "**Codexis Core Patents**" means the Patents set forth on Exhibit 1.19.

1.20 "**Codexis Core Technology**" means those (i) tools, processes and methods Controlled by Codexis; and (ii) generally applicable tools, processes and methods which Codexis has the ability to transfer to or license to Merck, in each of (i) and (ii) above: (a) used to identify, select, optimize, isolate, modify, engineer, research, develop, make, have made and/or import enzymes, Covered Enzymes and Enzymes, through the recombination and/or rearrangement and/or mutation of genetic material for the creation of genetic diversity, using any methods, including but not limited to Codexis Software, in silico, in vitro, and and/or in vivo technologies, (b) screening techniques, methodologies and/or processes of using the resulting genes and/or proteins to identify and assess their potential utility, (c) gene expression methods applicable in high throughput screening, (d) cultivation of microorganisms, (e) techniques for producing, harvesting, and/or purifying proteins, and (f) including the Codexis Software, in each of (a) – (f) above, as described in Exhibit 1.20.

1.21 "**Codexis Core Technology Improvements**" means any Improvement to the Codexis Core Technology practiced by Codexis or any Affiliate of Codexis which are licensed to Merck under Section 3.2, that is generated by Codexis, or both Parties, or on behalf of Codexis or both Parties, or by Codexis with a Third Party, during the TT Term (and, if Merck exercises the Option, during the Improvements TT Term) and is Controlled by Codexis, excluding any Improvement to the Codexis Core Technology which arises from Merck's Background IP.

1.22 "**Codexis Core Technology Improvements IP**" means any and all Intellectual Property Rights which is generated by or on behalf of Codexis or any Affiliate of Codexis or jointly between the Parties or any Affiliate of the Parties which Covers the Codexis Core

Technology Improvements. For clarity, the Codexis Core Technology Improvements IP excludes any Background IP of Merck, any Arising Merck Process Technology IP, any Arising Merck Enzyme Technology IP, and any Merck API Process Technology IP.

1.23 "**Codexis Documentation**" means any documentation disclosed by Codexis to Merck pursuant to Article 2 (including with respect to the Platform Technology and any Improvements), including all documentation relating to the Codexis Methods, the Technology Transfer Plan, and documentation related to the Codexis Software and the documentation described in the Technology Transfer Plan and any and all copies thereof, in whole or in part.

1.24 "**Codexis Enzymes**" means any Covered Enzyme which is Controlled by Codexis and transferred to Merck pursuant to the Technology Transfer Plan.

1.25 "**Codexis Enzyme Patents**" means the Patents set forth on Exhibit 1.25.

1.26 "**Codexis Initial Enzyme(s)**" means any Codexis Enzyme or any Enzyme contained within a Codexis Library which is designated as an Initial Enzyme pursuant to a Technology Transfer Project.

1.27 "**Codexis Library**" means any collection, set or sub-set of expression vectors containing genes Controlled by Codexis that encode for Covered Enzymes, Enzymes or enzymes, transferred to Merck under the Technology Transfer Plan, for the propagation of additional enzyme stock.

1.28 "**Codexis Materials**" means all biocatalytic materials disclosed or transferred to Merck by Codexis under and specifically in furtherance of this Agreement, including, without limitation, (a) the Codexis Libraries and Codexis Enzymes, and (b) kits and plates generally consisting of multiple, genetically-diverse enzymes that are made commercially available to the general public by Codexis through Codexis' catalog or website.

1.29 "**Codexis Mayflower Patents**" means the Patents set forth on Exhibit 1.29.

1.30 "**Codexis Methods**" means (a) as of the Effective Date, the methods and protocols listed in Appendix IV of the Technology Transfer Plan, and (b) after the Effective Date, the methods and protocols disclosed by Codexis and drafted by Codexis documenting in sufficient detail to enable a scientist with reasonable skills and experience in the field of protein engineering or protein biochemistry to practice the Platform Technology. The Codexis Methods shall include the most current and complete procedures used by Codexis as of the date on which they are disclosed to Merck with respect to the procedures described therein.

1.31 "**Codexis Software**" means [***], and all other software disclosed under the Technology Transfer Plan, as amended from time to time, together with all software Controlled by Codexis and disclosed by Codexis under this Agreement, including all versions and improvements practiced by Codexis during the TT Term, in each case solely in executable form.

1.32 "**Commercially Reasonable Efforts**" means, with respect to a Party's obligations under this Agreement, efforts consistent with the efforts and resources normally used by a similarly situated pharmaceutical, biotechnology or technology company in the exercise of its reasonable business discretion relating to the development or commercialization of a product with similar product characteristics that is of similar market potential at a similar stage of development or commercialization, taking into account issues of efficacy, safety, patent and regulatory exclusivity, product profile, anticipated or approved labeling, present and future market potential, competitive market conditions, the proprietary position of the compound or product, the regulatory structure involved, and other technical, legal, scientific, medical or commercial factors, and the profitability of the product, including in light of pricing and reimbursement issues.

1.33 "**Completion of Wave 1**" means the achievement of the Wave 1 Milestone Success Criteria as defined under the Technology Transfer Plan.

1.34 "**Completion of Wave 2**" means the achievement of the Wave 2 Success Criteria as defined under the Technology Transfer Plan.

1.35 "**Controlled**" or "**Controls**" means, when used in reference to an item of Technology or to Intellectual Property Rights, the legal authority or right of a Party (whether directly or through any of its Affiliates to the extent a Party has the requisite authority), whether by ownership, assignment or by license, other than pursuant to this Agreement, to grant the right to use such item of Technology or a license or sublicense of such Intellectual Property Rights to the other Party, or to otherwise disclose proprietary or trade secret information to such other Party, without violating any Applicable Law, breaching the terms of any agreement with any Third Party, or misappropriating the proprietary or trade secret information or other Intellectual Property Rights of a Third Party.

1.36 "**Cover**" or "**Covers**" means, a particular item or method encompassed by any Intellectual Property Rights, that, but for a license under or ownership right in such Intellectual Property Rights, the use, making, having made, offering for sale, sale, importation, or other exploitation of such item would infringe or misappropriate such Intellectual Property Rights (assuming, in the case of pending Patent applications, that such pending Patent applications were issued Patents).

1.37 "**Covered Enzyme**" means any enzyme that is Covered by the Licensed IP.

1.38 "**Designated Lab**" means the laboratory(ies) selected by Merck and specified in the Technology Transfer Plan which are located at a single Merck facility in the continental United States and designated to implement the Platform Technology. As of the Effective Date, the Designated Lab will be located at the single Merck facility set forth in Exhibit 1.38. Merck may, upon written notice to Codexis, change the location of a Designated Lab to another single Merck facility within the continental United States.

1.39 "**Diagnostic**" means [***].

1.40 "**Dollar**" or "**$**" means the lawful currency of the United States.

1.41 "**enzyme**" (without initial capital) means an immature or mature peptide or protein (including derivatives) with enzymatic or biocatalytic activity.

1.42 "**Enzyme**" means any enzyme which is derived from the use of the Platform Technology pursuant to this Agreement.

1.43 "**Excluded Claim**" mean a dispute, controversy or claim between the Parties that concerns: [***].

1.44 "**FDA**" means the U.S. Food and Drug Administration, or any successor agency thereto.

1.45 "**Fee Bearing Therapeutic Product**" means a Therapeutic Product for which development was initiated during the Initiation Period.

1.46 "**FTE**" means the equivalent of the work of one (1) Codexis scientist, or one (1) Merck scientist, as the case may be, full time for one (1) year. In no event will one (1) person count for more than one (1) FTE in any year.

1.47 "**U.S. GAAP**" means generally accepted accounting principles adopted by the U.S. Securities and Exchange Commission, consistently applied.

1.48 "**Generic Version**" means, with respect to a Therapeutic Product, that a Third Party is manufacturing and supplying on a commercial scale a pharmaceutical product therapeutically equivalent to the Therapeutic Product without infringing any Intellectual Property Rights Controlled by Merck or Codexis and such pharmaceutical product is A/B Rated with respect to a Therapeutic Product. For the purposes of this definition, "**A/B Rated**" means, inside the United States, "therapeutically equivalent" as evaluated by the FDA, applying the definition of

"therapeutically equivalent" set forth in the preface to the then-current edition of the FDA publication "Approved Drug Products With Therapeutic Equivalence Evaluations" and, outside the United States, such equivalent determination by the applicable Regulatory Authorities as is necessary to permit pharmacists or other individuals authorized to dispense pharmaceuticals under Applicable Law to substitute one product for another product in the absence of specific instruction from a physician or other authorized prescriber under Applicable Law.

1.49 "**Good Clinical Practices**" or "**GCP**" means the then-current international ethical and scientific quality standards for designing, conducting, recording and reporting trials that involve the participation of human subjects. In the United States, GCP shall be based on Good Clinical Practices established through FDA guidance (including ICH E6) and, outside the United States, GCP shall be based on ICH E6.

1.50 "**Good Laboratory Practices**" or "**GLP**" means the then-current Good Laboratory Practice (or similar standards) for the performance of laboratory activities for pharmaceutical products as are required by applicable Regulatory Authorities or Applicable Law. In the United States, Good Laboratory Practices are established through FDA regulations (including 21 C.F.R. Part 58), FDA guidance, FDA current review and inspection standards and current industry standards.

1.51 "**Good Manufacturing Practices**" or "**GMP**" means the then-current Good Manufacturing Practices for the manufacture of products as are required by applicable Regulatory Authorities or Applicable Law. In the United States, GMP shall be as defined under the rules and regulations of the FDA, as the same may be amended from time to time.

1.52 "**Improvement**" means an enhancement, extension, upgrade, improvement, derivative work, or update.

1.53 "**Improvements TT Term**" means the period beginning on the expiration of the TT Term and continuing until and ending on the earlier of (a) the Improvements TT Term Expiration Date, or (b) the early termination of this Agreement by Codexis in accordance with Sections 12.2, 12.3, 12.4 or 12.5.

1.54 "**Improvements TT Term Expiration Date**" means the [***] year anniversary of the TT Term Expiration Date or a later date if the Improvements TT Term is extended in accordance with Section 3.5.7.

1.55 "**Information**" means any and all information and data, including without limitation all Know-How and all other scientific, pre-clinical, clinical, regulatory, manufacturing,

marketing, financial and commercial information or data, whether communicated in writing or orally or by any other method, which is provided by one Party to the other Party in connection with this Agreement.

1.56 "**Initial Enzyme**" means the single Merck Initial Enzyme or Codexis Initial Enzyme contributed to a Technology Transfer Project which is selected to undergo Initial Enzyme Optimization. Once an Initial Enzyme is selected, such selection may only be changed by mutual written consent of the Parties.

1.57 "**Initial Enzyme Optimization**" means the process of optimizing an Initial Enzyme.

1.58 "**Initial Technology Transfer Inventory**" means all of the items set out in Appendices I, II and III of the Technology Transfer Plan.

1.59 "**Initiation Period**" means the period beginning on the TT Term Expiration Date and ending on the earlier of (a) the date that is ten (10) years after the TT Term Expiration Date, or (b) the termination of this Agreement.

1.60 "**In-License Agreements**" means all agreements pursuant to which any Licensed IP is licensed or sublicensed to Codexis from a Third Party and which are listed in Exhibit 1.60.

1.61 "**In-Licensed IP**" means the In-Licensed Patents and any In-Licensed Know-How.

1.62 "**In-Licensed Know-How**" means all Know-How of Third Parties Controlled by Codexis as of the Effective Date and licensed to Codexis pursuant to the In-License Agreements, in each case that Covers the Codexis Documentation, the Codexis Materials, Know-How related to the operation of the Codexis Software (but excluding the Codexis Software itself) or the practice of the Platform Technology.

1.63 "**In-Licensed Patents**" means the Patents set forth on Exhibit 1.63.

1.64 "**Intellectual Property Rights**" means Patents, Know-How and copyrights, including all applications for registration for the foregoing and all other similar proprietary rights as may exist anywhere in the world.

1.65 "**Internal Research Purposes**" means scientific research programs in the animal and/or human healthcare field conducted internally by Merck or its Affiliates, which are

specifically directed to the purposes of their internal research, but excluding the discovery of novel Therapeutics [***].

1.66 "**Invention**" means any discovery, invention, contribution, method, finding, or improvement, whether or not patentable, and all related Know-How.

1.67 "**Invoice**" means any invoice submitted to Merck by Codexis under this Agreement, produced in accordance with Merck's processing requirements.

1.68 "**Know-How**" means non-public materials and technical information, including techniques, methods, processes, technology, recipes, formulae, designs, equipment configurations and uses, biological samples, compounds and cell lines, and biological, chemical, pharmacological, toxicological, clinical, assay and related trade secrets, manufacturing data, preclinical and clinical data, specifications, ingredients, manufacturing processes, formulation, specifications, sourcing information, quality control and testing procedures, and related know-how and trade secrets and including all of the foregoing related to the operation of the Codexis Software, but in each case excluding the Codexis Software itself.

1.69 "**knowledge of Codexis Senior Management**" means, with respect to any matter in question, that any of Codexis' [***]

[***] is actually aware or has actual knowledge of such matter [***].

1.70 "**Licensed Additional Codexis Know-How**" means any and all Know-How which (a) Codexis or any Codexis Affiliate comes to Control during the TT Term (and, if Merck exercises the Option, during the Improvements TT Term) and which Covers (i) the Platform Technology, (ii) Arising Codexis Enzyme Technology, (iii) Arising Codexis Process Technology, (iv) any Codexis Core Technology Improvements, (v) the Codexis Documentation, or (vi) Codexis Materials and including any Know-How related to the operation of the Codexis Software, but in each case excluding the Codexis Software itself, and (b) Codexis or any Codexis Affiliate comes to Control during the Term and which Covers the Merck Core Technology Improvements.

1.71 "**Licensed Additional Codexis Patents**" means any and all Patents which (a) Codexis or any Affiliate comes to Control during the TT Term (and, if Merck exercises the Option, during the Improvements TT Term) and which Covers (i) the Platform Technology, (ii) Arising Codexis Enzyme Technology, (iii) Arising Codexis Process Technology, or (iv) any Codexis Core Technology Improvements and (b) Codexis or any Codexis Affiliate comes to Control during the Term and which Covers the Merck Core Technology Improvements.

1.72 "**Licensed IP**" means (a) the Licensed Patents, (b) the In-Licensed Patents (c) the Licensed Know-How, (d) the In-Licensed Know-How, (e) the Licensed Additional Codexis Know-How and (f) the Licensed Additional Codexis Patents.

1.73 "**Licensed Know-How**" means any Know-How Controlled by Codexis as of the Effective Date which is disclosed or provided to Merck pursuant to the Technology Transfer Plan, including the Codexis Documentation, Codexis Materials and Know-How related to the operation of the Codexis Software (but excluding the Codexis Software itself), but only to the extent existing as of the Effective Date.

1.74 "**Licensed Patents**" means the Codexis Core Patents, the Codexis Mayflower Patents and the Codexis Enzyme Patents.

1.75 "**Losses**" means any liability, loss, damage, expense (including reasonable legal expenses, costs of litigation, and attorneys' fees) or judgment, whether for money or equitable relief, of any kind.

1.76 "**Merck API Process Technology**" means all Technology (excluding however any Process Technology) of or relating to manufacturing or processing an active pharmaceutical ingredient, in either case which Technology relates to a specific active pharmaceutical ingredient, including any Merck Developed API, developed by or for (other than any Technology developed by Codexis on behalf of Merck or any of its Affiliates) or otherwise Controlled by Merck, but in each case excluding the Codexis Software.

1.77 "**Merck API Process Technology IP**" means all Intellectual Property Rights of any kind or nature in or to any Merck API Process Technology.

1.78 "**Merck Core Technology Improvements**" means any Improvement to the Codexis Core Technology practiced by Merck or any Affiliate of Merck that is generated solely by Merck during the Term, excluding any Improvement to the Codexis Core Technology which arises from Merck's Background IP.

1.79 "**Merck Core Technology Improvements IP**" means any and all Intellectual Property Rights which are generated solely by Merck or any Affiliate of Merck which Cover the Merck Core Technology Improvements. For clarity, the Merck Core Technology Improvements IP excludes any Background IP of Merck, any Arising Merck Process Technology IP, any Arising Merck Enzyme Technology IP, and any Merck API Process Technology IP.

1.80 "**Merck Developed API**" means any active pharmaceutical ingredient, where such active pharmaceutical ingredient is owned or Controlled by Merck and developed and/or manufactured by Merck using at least one (1) Enzyme.

1.81 "**Merck Exclusive Field**" means the research, development, and manufacture of Covered Enzymes and Enzymes for use in the animal and/or human healthcare field solely by Merck and its Affiliates, or on behalf of Merck and its Affiliates in accordance with Section 3.2, in the chemical synthesis of Therapeutic Products owned or Controlled by Merck (including, for clarity, the chemical synthesis of Merck Developed APIs for formulation into any Therapeutic Controlled by Merck), but excluding, in any event, the discovery of any Therapeutic Enzyme, Diagnostic, or Vaccine.

1.82 "**Merck Initial Enzyme(s)**" means any enzyme (which for clarity is not an "Enzyme") that is provided by Merck and which is designated as an Initial Enzyme pursuant to a Technology Transfer Project excluding, for clarity, Enzymes derived from a Codexis Enzyme or a Codexis Library.

1.83 "**Merck Non-Exclusive Field**" means the research, development, and manufacture of Covered Enzymes and Enzymes for use solely by Merck and its Affiliates, or on behalf of Merck and its Affiliates in accordance with Section 3.2, for Internal Research Purposes, but excluding, in any event, the discovery of any Therapeutic Enzyme, Diagnostic, or Vaccine, or any sale, lease, license, transfer or use of such Covered Enzymes or Enzymes as a standalone product or a component of a product.

1.84 "**Merck Project Library**" means any collection, set or sub-set of Enzymes and/or expression vectors containing genes that encode for Enzymes derived from a Technology Transfer Project.

1.85 "**Option Improvements**" means all Improvements relating to the Platform Technology, including, without limitation, Codexis Core Technology Improvements (including any and all Improvements to the Codexis Methods, the Initial Technology Transfer Inventory and the Codexis Software), Improvements to the Codexis Materials and/or the Codexis Documentation, which have come to be Controlled by Codexis during the applicable Option Year.

1.86 "**Option Year**" means each of the [***] twelve (12)-month periods commencing with the day immediately following the TT Term Expiration Date and thereafter commencing with each anniversary thereof. For clarity, the [***].

1.87 "**Patent(s)**" means (a) patents and patent applications anywhere in the world, (b) all divisionals, continuations, continuations in-part thereof or any other patent application claiming priority, or entitled to claim priority, directly or indirectly to (i) any such patents or patent applications, or (ii) any patent or patent application from which such patents or patent applications claim, or is entitled to claim, direct or indirect priority, (c) all patents issuing on any of the foregoing anywhere in the world, together with all registrations, reissues, re-examinations, patents of addition, renewals, substitutions, validations, and re-validations, supplemental protection certificates or extensions of any of the foregoing anywhere in the world, and (d) all provisional and any other priority patent applications filed worldwide.

1.88 "**Person**" means any individual, firm, corporation, partnership, limited liability company, trust, business trust, joint venture, governmental authority, association or other entity.

1.89 "**Phase III Clinical Trial**" means a human clinical trial in any country that would satisfy the requirements of 21 CFR 312.21(c).

1.90 "**Platform Technology**" means (a) the Codexis Core Technology, (b) the Codexis Enzymes, and (c) the Codexis Libraries, and in each case, which are provided to Merck by Codexis under this Agreement.

1.91 "**Process Technology**" means any method, process, or other invention pertaining to the use of any Covered Enzyme or Enzyme; *provided* that Process Technology shall exclude Technology that is generally applicable to chemical process development and to the synthesis and scale up of compounds and that does not specifically require the use or performance of an enzyme, Covered Enzyme, or Enzyme.

1.92 "**Project Enzyme**" means any Enzyme derived from an Initial Enzyme arising from a Round of Enzyme Evolution.

1.93 **"Prosecution**" means the preparation, drafting, filing, prosecution (including any interferences, reissue proceedings, reexaminations, inter partes reviews, post-grant reviews, oppositions and Patent office appeals) and maintenance of Patents in the Territory. When used as a verb, "**Prosecute**" means to engage in Prosecution.

1.94 "**Regulatory Approval(s)**" means, with respect to any Therapeutic Product in any jurisdiction, all approvals from any Regulatory Authority necessary for the commercial manufacture, marketing and sale of any product containing such Therapeutic Product in such

jurisdiction in accordance with Applicable Law, including without limitation, receipt of pricing and reimbursement approvals, where required.

1.95 "**Regulatory Authority**" means any national or supranational governmental authority, including without limitation, the FDA, which has responsibility in countries in the Territory over the development and/or commercialization of any Therapeutic Product, as applicable.

1.96 "**Regulatory Filings**" means any and all regulatory applications, filings, approvals and associated correspondence required to develop any Therapeutic Product in each country or jurisdiction in the Territory.

1.97 "**Restricted Enzyme**" means any enzyme, or any vector that encodes for any such enzyme, listed in Exhibit 1.97. During the Term, Exhibit 1.97 may be revised in accordance with Section 3.6.

1.98 "**ROFR Period**" means, with respect to a given Merck Developed API, the period beginning on completion of a [***]

[***] and ending on the [***].

1.99 "**Round(s) of Enzyme Evolution**" means round of Initial Enzyme Optimization conducted during a Technology Transfer Project resulting in Project Enzymes.

1.100 "**Sitagliptin Agreement**" means that certain Sitagliptin Catalyst Supply Agreement entered into by and between the Parties and effected as of February 1, 2012.

1.101 "**Technology**" means Know-How, Inventions, industrial designs, works of authorship, development tools, files, records and data, all emulation and simulation tools and reports, prototypes, sequences, structures, databases and data collections, and all tangible embodiments of the foregoing, *provided, however*, Technology shall not include Codexis Software (or software, source code, object code, graphical user interfaces, application programming interfaces, programs, objects, modules, algorithms, routines or firmware used or utilized in Codexis Software).

1.102 "**Technology Transfer**" means (a) the transfer to Merck of the Platform Technology, Codexis Documentation, Codexis Software, Codexis Materials, and Improvements thereto which come to be Controlled by Codexis during the TT Term (and, if Merck exercises an Option, during that portion of the Improvements TT Term for which the exercised Option applies), and (b) the training provided to Merck with respect to the Platform Technology, in each case to be conducted in accordance with the Technology Transfer Plan and Article 2.

1.103 "**Technology Transfer Plan**" means that plan for the Technology Transfer as mutually agreed between the Parties and set forth in Exhibit 1.103 as of the Effective Date and as may be amended by the Parties during the TT Term in accordance with Section 2.2.2 itemizing each Party's responsibilities and obligations, the activities to be performed by each Party, and a timeline for performance of such activities, in connection with the Technology Transfer from Codexis to Merck to fully implement the Platform Technology at the Designated Lab.

1.104 "**Technology Transfer Project**" means any Enzyme evolution project that was initiated using an Initial Enzyme during the TT Term.

1.105 "**Territory**" means all of the countries in the world, and their territories and possessions.

1.106 "**Therapeutic**" means a compound, molecule, pharmaceutical, drug, biological preparation, or other product for the treatment or prevention of any disease or medically treatable or preventable condition.

1.107 "**Therapeutic Enzyme**" means [***].

1.108 "**Therapeutic Product**" means any Therapeutic owned or Controlled by Merck or its Affiliates (or their permitted licensees, successors, assigns and transferees) containing a Merck Developed API.

1.109 "**Third Party**" means any Person other than Merck and Affiliates of Merck, and Codexis and Affiliates of Codexis.

1.110 "**TT Term**" means the period beginning on the Effective Date and ending on the TT Term Expiration Date.

1.111 "**TT Term Expiration Date**" means the earlier of (a) the date of satisfactory completion of the Technology Transfer (in accordance with Section 2.2.7), or (b) the later to occur of fifteen (15) months following the Effective Date or such later date as determined pursuant to Section 2.2.7.

1.112 "**United States**" or "**U.S.**" means the United States of America and all its territories and possessions.

1.113 "**Vaccine**" means [***].

1.114 "[***]" means that either [***].

1.115 "**Wave**" means each phase of the Technology Transfer noted as Wave 1 and Wave 2 of the Technology Transfer Plan in force as of the Effective Date, and from time-to-time during the TT Term.

2. TECHNOLOGY TRANSFER

2.1 Management of Technology Transfer.

2.1.1 Scientific Lead. Each Party shall designate in writing within fifteen (15) days after the Effective Date, a "**Scientific Lead**" with all necessary scientific skill and expertise to fulfil such role in accordance with this Article 2, to be the primary contact for such Party responsible for managing day-to-day communications between the Parties with respect to the technical aspects of the Technology Transfer and other scientific and technical activities (including any Additional Services) set forth in this Agreement, including responsibility for scheduling teleconferences and coordinating meetings and technical support as required hereunder. Each Party may respectively appoint a substitute Scientific Lead to represent it under this Section 2.1.1.

2.1.2 Alliance Manager. Each Party shall designate in writing within fifteen (15) days after the Effective Date, an "**Alliance Manager**" with all necessary business skill and expertise as necessary to be the primary contact for such Party as regards all business development and/or contract-related communications between the Parties for all matters in connection with this Agreement, outside of the purview of the technical matters for which the Scientific Leads are responsible. The Alliance Managers shall be responsible for initially addressing any finance, legal and business issues that may arise. Each Party may respectively appoint a substitute Alliance Manager to represent it under this Section 2.1.2.

2.1.3 Limitations. The Scientific Leads and the Alliance Managers shall not have the authority to amend, modify or waive compliance with this Agreement, through meeting minutes, e-mails or otherwise.

2.2 Technology Transfer.

2.2.1 Technology Transfer Plan. The Parties shall perform the Technology Transfer in Waves during the TT Term pursuant to the timelines and in accordance with the responsibilities allocated under the Technology Transfer Plan. Each Party shall perform the activities assigned to such Party under the Technology Transfer Plan at the sites identified in Section 2.2.6 and shall perform all such activities in compliance with Applicable Law. Each Party shall be responsible for all salaries and costs and expenses of their own personnel (including, without limitation, travel and living expenses). Without limiting the foregoing, Codexis shall provide Merck

the Codexis Methods at dates no later than those set forth in the timelines in the Technology Transfer Plan. Codexis shall promptly transfer to Merck (a) the Initial Technology Transfer Inventory, (b) the Codexis Materials, (c) the Codexis Documentation, and (d) the Codexis Software and other Platform Technology, at dates no later than those set forth in the timelines in Technology Transfer Plan. All Technology Transfer activities shall be performed [***] by the Parties. Notwithstanding anything to the contrary, subject to any updates to the Technology Transfer Plan pursuant to Section 2.2.2, Codexis shall not be obligated to transfer to Merck any information and/or materials not described in the Technology Transfer Plan.

2.2.2 Updates to Technology Transfer Plan. In the event that errors and/or omissions in the Technology Transfer Plan are discovered by Merck and/or Codexis during the TT Term and the Parties agree to update the Technology Transfer Plan pursuant to any reasonable scientific rationale agreed between the Parties to enable Merck to practice the Platform Technology, the Parties shall then update the Technology Transfer Plan accordingly.

2.2.3 Improvements Arising During TT Term. Within [***] after the end of the Calendar Quarters ending June 30 and December 31, Codexis will disclose to Merck any and all Improvements relating to the Platform Technology which have come to be Controlled by Codexis at any time during the TT Term, and which have been identified and are being practiced by Codexis in its own business operations, including, without limitation, all Codexis Core Technology Improvements (including any and all Improvements to the Codexis Methods, the Initial Technology Transfer Inventory and the Codexis Software), Improvements to the Codexis Materials and the Codexis Documentation, Arising Codexis Enzyme Technology, and/or Arising Codexis Process Technology which come to be Controlled by Codexis during the TT Term. [***]

2.2.4 Technology Transfer Teams. In order to effect Section 2.2:

(a) Merck shall identify a Technology Transfer team of personnel and in such numbers as it may so determine (the "**Merck Team**") to participate in the Technology Transfer. Merck may change any member(s) of the Merck Team in its sole discretion at any time. The Merck Team shall have all reasonable skills and experience in the field of protein engineering to perform the Technology Transfer. [***]. [***], Merck shall remain at all times fully liable for its respective responsibilities with respect to the Technology Transfer.

(b) Codexis shall identify a Technology Transfer team to lead the Merck Team in the Technology Transfer (the "**Codexis Team**") as detailed in the Technical Transfer Plan. Codexis, in its sole discretion, may change any member(s) of the Codexis Team at any time. Each member of the Codexis Team shall have all necessary scientific experience and expertise

to perform the Technology Transfer in accordance with the Technology Transfer Plan. [***]. [***], Codexis shall remain at all times fully liable for its respective responsibilities with respect to the Technology Transfer.

2.2.5 Wave 1 of Technology Transfer Plan. After the Effective Date, the Codexis Team will transfer Codexis screening capabilities to Merck as outlined in the Technology Transfer Plan. Wave 1 will be deemed complete upon Completion of Wave 1.

2.2.6 Wave 2 of Technology Transfer Plan. On an agreed-upon date, the Codexis Team and the Merck Team will participate in Wave 2 of Technology Transfer activities by enabling Merck to practice the Platform Technology at the Designated Lab. As part of Wave 2, Codexis and Merck shall participate in Technology Transfer Project 1 at Codexis' facility in Redwood City, California and Technology Transfer Project 2 at the Designated Lab. Each of Merck and Codexis shall bear its own costs and expenses of providing such training. Wave 2 will be deemed complete upon Completion of Wave 2.

2.2.7 Completion of Technology Transfer. The Technology Transfer will be deemed complete upon the Completion of Wave 1 and the Completion of Wave 2. If the Completion of Wave 1 does not occur within [***] from the Effective Date and/or the Completion of Wave 2 does not occur by the TT Term Expiration Date, and the delay in the Completion of Wave 1 and/or the Completion of Wave 2 is proximately caused by decision(s), action(s) or inaction(s) of Merck, its Affiliates and/or Third Parties controlled by Merck and/or its Affiliates, then the TT Term Expiration Date shall be extended by the period of time equal to the delay in the Completion of Wave 1 and/or the Completion of Wave 2 which is proximately caused by such decision(s), action(s) and/or inaction(s) of Merck, its Affiliates and/or Third Parties controlled by Merck or its Affiliates, *provided, however*, in no event will the TT Term Expiration Date be extended pursuant to this Section 2.2.7 beyond [***] from the Effective Date where any such extension is proximately caused by decision(s), action(s) or inaction(s) of Merck, its Affiliates and/or Third Parties controlled by Merck and/or its Affiliates. If Completion of Wave 1 and/or the Completion of Wave 2 are not achieved on or before [***] from the Effective Date where such non-achievement is proximately caused by decision(s), action(s) or inaction(s) of Merck, its Affiliates and/or Third Parties controlled by Merck and/or its Affiliates, the applicable milestone payment(s) set forth in Section 7.3 shall be paid to Codexis in the manner set forth in Section 7.3. In the event either Party reasonably disputes whether or not the Completion of Wave 1 and/or the Completion of Wave 2 have occurred, the Parties will submit such dispute for resolution in accordance with Article 13.

2.3 Transfers of Materials. In the event that the Parties mutually agree that a transfer of any biopharmaceutical, biological, chemical or other like material ("**Material(s)**") from

one Party to the other Party is necessary or desirable to facilitate the Parties' collaborative activities pursuant to this Agreement then, except (i) where Codexis Materials are transferred by Codexis to Merck pursuant to the Technology Transfer Plan (which in all cases shall be itemized and recorded in writing, such written records to be sent to Merck for confirmation of receipt of all such items), or (ii) where Materials are transferred by Codexis to Merck and are identified as a "deliverable" under a Statement of Work, such Materials will be transferred subject to and in accordance with a material transfer agreement in a form satisfactory to both Parties.

2.4 Designated Lab. Merck shall be responsible for providing space for the Designated Lab, procuring all equipment necessary for operation of the Designated Lab, designing the Designated Lab, and constructing the Designated Lab.

3. LICENSES

3.1 Licenses to Codexis.

3.1.1 Merck Background IP License. Subject to the terms and conditions of this Agreement, Merck hereby grants to Codexis, during the Term, a worldwide, non-exclusive, non-transferable (except as provided in Section 14.8), fully paid-up, royalty-free right and license, with the right to grant sublicenses solely to Affiliates, under Merck's Background IP in the Merck Exclusive Field and Merck Non-Exclusive Field solely as necessary for Codexis to perform its obligations during the Technology Transfer and under each Technology Transfer Project as set forth in the written research plan applicable to such Technology Transfer Project and for any Additional Services.

3.1.2 Arising Merck Enzyme Technology IP. Subject to the terms and conditions of this Agreement (including, for the avoidance of doubt, Article 12), Merck hereby grants to Codexis a worldwide, exclusive, non-transferable (except as provided in Section 14.8), fully paid-up, royalty-free right and license, with the right to grant sublicenses through multiple tiers, under the Arising Merck Enzyme Technology IP invented using the Platform Technology, solely to improve, make, have made, use, and sell Enzymes for use solely outside of the Merck Exclusive Field.

3.1.3 Arising Merck Process Technology IP. Subject to the terms and conditions of this Agreement (including, for the avoidance of doubt, Article 12), Merck hereby grants to Codexis a worldwide, non-exclusive, non-transferable (except as provided in Section 14.8), fully paid-up, royalty-free right and license, with the right to grant sublicenses through multiple tiers, under the Arising Merck Process Technology IP (excluding, in any event, any Merck API Process Technology IP) invented using the Platform Technology for any use solely outside of the Merck

Exclusive Field. During [***] and for a period of [***], Codexis covenants and agrees that, notwithstanding [***]. After the [***] period, Codexis shall [***], *provided* that Codexis shall [***]

3.2 Licenses to Merck.

3.2.1 Platform Technology Licenses. Subject to the terms and conditions of this Agreement (including the limitations set forth in Section 3.4), Codexis on behalf of itself and its Affiliates hereby grants to Merck, during the Term, a nontransferable (except as provided in Section 14.8), right and license, with the right to grant sublicenses to Affiliates, in accordance with, and to the extent permitted under, Section 3.3, under the Licensed IP in the Territory, with respect to enzymes, including any enzyme owned or otherwise Controlled by Merck under this Agreement or otherwise, to use in the Designated Lab the Platform Technology (or any aspect of the Platform Technology) (but excluding the Codexis Software, which shall instead be subject to the license set forth in Section 3.2.2, below), which right and license shall be:

(a) exclusive in the Merck Exclusive Field; and

(b) non-exclusive in the Merck Non-Exclusive Field;

in each of Sections 3.2.1(a) and 3.2.1(b), solely to research, develop, use, optimize, modify, isolate, engineer, identify, select, make, have made, import and/or export, Enzymes, other than any Restricted Enzyme.

3.2.2 License to Codexis Software. Subject to the terms and conditions of this Agreement (including the limitations set forth in Section 3.4), Codexis on behalf of itself and its Affiliates hereby grants to Merck, during the Term, a nontransferable (except as provided in Section 14.8), right and license, sublicensable to Affiliates in accordance with, and to the extent permitted under, Section 3.3), to (i) deploy [***] the Codexis Software on Approved Servers, and (ii) access and use [***] the Codexis Software solely from the Designated Lab. [***] The foregoing license set forth in this Section 3.2.2 shall be:

(a) exclusive in the Merck Exclusive Field; and

(b) non-exclusive in the Merck Non-Exclusive Field;

in each of Sections 3.2.2(a) and 3.2.2(b), solely to research, develop, use, optimize, modify, isolate, engineer, identify select, make, have made, import and/or export Enzymes, other than any Restricted Enzyme.

3.2.3 Manufacturing Licenses. Subject to the terms and conditions of this Agreement (including the limitations set forth in Section 3.4), Codexis hereby on behalf of itself and its Affiliates grants to Merck, during the Term, a non-transferable (except as provided in Section 14.8) right and license, with the right to grant sublicenses to Affiliates, contract manufacturing organizations (CMOs), contract research organizations (CROs), or other contract service organizations in accordance with and to the extent permitted under Section 3.3 under the Licensed IP in the Territory, solely to make, have made, import and/or export Enzyme(s) for use in Therapeutic Product(s) or Merck Developed API(s), which right and license shall be:

(a) exclusive in the Merck Exclusive Field; and

(b) non-exclusive in the Merck Non-Exclusive Field.

3.2.4 Loss of Exclusivity. The exclusive licenses granted by Codexis to Merck in the Merck Exclusive Field pursuant to Sections 3.2.1, 3.2.2 and 3.2.3 shall become non-exclusive, on a Therapeutic-by-Therapeutic and country-by-country basis, on the first date that both (i) [***], and (ii) [***].

3.3 Sublicensing. To the extent that either Party is permitted to grant sublicenses under the licenses granted to it under this Agreement, either Party shall have the right to grant such sublicenses through multiple tiers of sublicensees; *provided* that:

3.3.1 any sublicense agreement between Merck and a Third Party sublicensee relating to the performance of Merck's obligations or exercise of Merck's rights under this Agreement shall include material transfer terms, and non-use and non-disclosure confidentiality terms, that are no less stringent than terms used by Merck in the ordinary course of Merck's business in similar transactions involving Merck's proprietary materials and information of a similar nature;

3.3.2 any such sublicense is consistent with and subject to the terms of this Agreement and shall terminate automatically upon termination of the corresponding license hereunder;

3.3.3 each Party, within thirty (30) days after the effective date of any sublicense, shall provide written notice to the other Party of the grant, the date, and the identity of the Third Party of any sublicense to a Third Party;

3.3.4 each Party shall not be relieved of its obligations pursuant to this Agreement as a result of such sublicense ; and

3.3.5 any sublicense granted by Merck shall (a) prohibit the sublicensee from using the Platform Technology for any purpose other than as specified in Section 3.2.1, Section 3.2.2 and Section 3.2.3 and (b) require the sublicensee to destroy all Platform Technology, and all Information of Codexis, in possession of such sublicensee after completion of the sublicensee's obligations under such sublicense.

3.4 Limitations on Licenses.

3.4.1 In-Licensed Patents. With respect to any aspect of the In-Licensed Patents for which Codexis has less than fully exclusive, worldwide rights (e.g., co-exclusive, non-exclusive, limited territorial or otherwise restricted rights), the licenses provided in Sections 3.2.1, 3.2.2, 3.2.3 and 3.5.6 shall be limited to the scope of those rights that Codexis Controls.

3.4.2 Codexis Mayflower Patents. The licenses provided in Sections 3.2.1, 3.2.2, 3.2.3 and 3.5.6 shall be limited as set forth in Exhibit 3.4.2.

3.4.3 No Use for Third Parties.

(a) Merck shall not use, and shall cause its Affiliates and permitted sublicensees not to use, the Platform Technology to engineer, synthesize, manufacture or otherwise develop or produce any Enzymes, molecules, biologic agents, drug products, therapeutic agents or any other compounds for or on behalf of any Third Party and/or to that Third Party's order or direction. [***] if Merck or any Affiliate [***] and Merck or such Affiliate, [***] then Merck and/or its Affiliate may, [***]

[***]

(b) Merck shall not use, and shall cause its Affiliates and permitted sublicenses not to use, the Platform Technology to make or have made and sell, offer for sale, lease, barter, donate or otherwise transfer any enzymes or Enzymes to any Third Party. [***] if Merck or any Affiliate [***] and Merck or such Affiliate, [***] then (a) Merck or its Affiliates [***] and (b) Merck may [***].

(c) Merck shall [***].

3.4.4 Enzyme Supplier. During the Term, [***] would supply to Merck or its Affiliates or permitted sublicensees any Enzymes developed using rights licensed by Codexis to Merck under the terms of this Agreement, [***].

3.4.5 Codexis Software Restrictions. Codexis retains ownership of all Codexis Software and rights therein and Merck will maintain the copyright notice and any other notices that appear on the Codexis Software on any copies and any media. Merck will not (and will not allow any Affiliate or Third Party to) [***]

[***]. Prior to disposing of any media or apparatus containing any part of the Codexis Software, Merck shall completely destroy any Codexis Software contained therein. All the limitations and restrictions on Codexis Software in this Agreement shall also apply to any Codexis Documentation for the Codexis Software. Merck acknowledges and agrees that it will be solely responsible for providing, maintaining, and supporting the Approved Servers.

3.5 Options to Improvements Arising After TT Term.

3.5.1 Option Grants. Subject to the terms and conditions of this Agreement, Codexis hereby grants to Merck [***] annual options, exercisable within the Improvements TT Term and [***] thereafter at Merck's sole discretion in accordance with Section 3.5.2, to acquire the rights described in Section 3.5.3, which options shall be exclusive as to the Merck Exclusive Field and non-exclusive in the Merck Non-Exclusive Field (each, an "**Option**").

3.5.2 Initial Disclosure. Within [***] following each Option Year, Codexis will discuss with Merck any Option Improvements which have come to be Controlled by Codexis during the applicable Option Year and which have been identified and are being practiced by Codexis in its own business operations, and will describe all such Option Improvements to Merck in sufficient detail to assist Merck in determining whether to exercise an Option with respect to such Option Improvements. Merck shall have [***] after receipt of the initial disclosure regarding such Option Improvements to request the disclosure of further information Controlled by Codexis with respect to such Option Improvements ("**Option Evaluation Request**"). All such disclosures, whether initial or subsequent, shall be considered the Information of Codexis.

3.5.3 Option Exercise. Merck shall have [***] after receipt of the initial disclosure or, if an Option Evaluation Request is timely made, [***] from the date of Codexis' further disclosure of information disclosure pursuant to the Option Evaluation Request, to request in writing that Codexis disclose and license the Option Improvements to Merck ("**Option Election Date**"). If Merck timely exercises an Option, then Merck shall, within [***] of the Option Election Date, pay to

Codexis the sum of [***] for the Option elected and Codexis will promptly disclose to Merck any and all Option Improvements subject to such Option and such Option Improvements shall be deemed licensed to Merck under Section 3.5.6.

3.5.4 [***] Exercise of Option. Merck will be [***].

For example, if Merck [***]

[***]

3.5.5 Role of Scientific Lead. During the Improvements TT Term and for [***] thereafter, if Merck exercises an Option with respect to any Option Improvements, Codexis shall make its Scientific Lead reasonably available to provide telephonic or web-based advisory technical support and assistance to Merck in Merck's practice of the Platform Technology and such Option Improvements.

3.5.6 Grant of Rights. Subject to the terms and conditions of this Agreement (including the limitations set forth in Sections 3.2, 3.3 and 3.4), effective immediately upon Merck's exercise of an Option in accordance with Section 3.5.3, Codexis hereby on behalf of itself and its Affiliates grants to Merck a worldwide, non-transferrable (except as permitted under Section 14.8), non-sublicensable (except as permitted in accordance with Sections 3.2.1, 3.2.2 and 3.2.3) license, which license shall be either exclusive, non-exclusive or both as determined in accordance with Sections 3.2.1, 3.2.2 and 3.2.3, under all of Codexis' right to Codexis Core Technology Improvements IP practiced by Codexis during the Option Year for which the Option is exercised (pursuant to Section 3.5.3) or [***] exercised (pursuant to Section 3.5.4). Codexis shall provide any technology transfer or scientific or technical resources reasonably requested by Merck, and reasonably necessary for Merck, to practice such Codexis Core Technology Improvements IP, at Merck's reasonable expense. During the Improvements TT Term, Codexis' Alliance Manager will periodically disclose to Merck's Alliance Manager information regarding new, updated or improved Enzyme kits or panels (as defined in this Section 3.5.6 below). For purposes of this Section 3.5.6, the term "new, updated or improved Enzyme kits or panels" means a collection of multiple, genetically-diverse Enzymes, Controlled by Codexis, that are first made commercially available to the general public by Codexis through Codexis' catalog or website. All information, documents and other materials provided by Codexis to Merck pursuant to this Section 3.5.6 shall constitute Information of Codexis.

3.5.7 Extension of the Improvements TT Term. Upon mutual written agreement of the Parties, and payment by Merck to Codexis of an amount to be mutually agreed in

good faith by the Parties, within the sixty (60) day period prior to the then-current Improvements TT Term Expiration Date, the Improvements TT Term Expiration Date may be extended by one (1) year. The Parties may extend the Improvements TT Term Expiration Date any number of times in accordance with this Section 3.5.7.

3.6 Restricted Enzymes.

3.6.1 During the Term, in its ordinary course of business, Codexis will conduct research and development activities for itself and Third Parties under the Licensed IP using the Platform Technology and, in connection with such research and development activities, will generate Potentially Restricted Enzymes that, in certain cases, on a Potential Restricted Enzyme-by-Potentially restricted Enzyme basis, (a) will be owned in whole or in part by such Third Parties or exclusively licensed in whole or in part by Codexis to such Third Parties, (b) will not be Controlled by Codexis, or (c) Codexis otherwise has a reasonable basis to designate as a Potentially Restricted Enzyme. For purposes of this Section 3.6.1, the term "**Potentially Restricted Enzyme**" means any enzyme, or any vector that encodes for enzyme, derived from the use of the Platform Technology by Codexis after the Effective Date that, in either case, may not be Controlled by Codexis or is an enzyme that Codexis has a reasonable basis to designate as a Potentially Restricted Enzyme. In the event that any Potentially Restricted Enzyme generated by Codexis is not Controlled by Codexis or is an enzyme that Codexis has a reasonable basis to designate as a Potentially Restricted Enzyme, Codexis, subject to confidentiality obligations owed by Codexis to any Third Party, will inform the Patent Committee of such Potentially Restricted Enzyme at its next regularly scheduled meeting and amend the list of Restricted Enzymes set forth in Exhibit 1.97 to include the Potentially Restricted Enzyme. The Patent Committee will review information provided by Codexis with respect to any such Potentially Restricted Enzyme and, in accordance with Section 5.5.3, determine whether the list of Restricted Enzymes set forth on Exhibit 1.97 shall be revised to include such Potentially Restricted Enzyme and, if applicable, any particular field(s) and/or use(s) restrictions with respect to such Potentially Restricted Enzyme. The Patent Committee will create and maintain a list of all Potentially Restricted Enzymes.

3.6.2 In the event that Merck wishes to exercise its rights under Section 3.6.1 to any Restricted Enzyme for any specific field(s) and/or use(s), it shall notify Codexis in writing of such request. Codexis shall then have [***] in which to confirm to Merck in writing whether Codexis Controls such Restricted Enzyme for such specific field(s) and/or use(s) requested by Merck. In the event that Codexis does Control such Restricted Enzyme for such specific field(s) and/or use(s) then effective upon the date of such written confirmation from Codexis, such Restricted Enzyme shall be an Enzyme for such specific field(s) or use(s) for the purpose of Section 3.2. [***]

3.7 Merck Developed Improvements. During the Term, within [***] after the end of the Calendar Quarters ending June 30 and December 31, Merck's representative on the Patent Committee will meet and discuss with Codexis' representative on the Patent Committee any Codexis Core Technology Improvements, Merck Core Technology Improvements, Arising Merck Enzyme Technology, and Arising Merck Process Technology (other than any Merck API Process Technology) which Merck has developed since the last such meeting. Codexis shall have [***] after such meeting and receipt of the initial disclosure regarding such Codexis Core Technology Improvements, Merck Core Technology Improvements, Arising Merck Enzyme Technology, and Arising Merck Process Technology to request the disclosure of further information and Technology which is Controlled by Merck. Any disclosures or transfers of Technology from Merck to Codexis under this Section 3.7 shall be at Codexis' sole expense.

3.8 Public Domain Information and Material. Codexis acknowledges and agrees that Merck shall be free to utilize, without restriction, any information, material, or other Technology that is (a) within the Platform Technology (including any Improvements thereto) and (b) wholly within the public domain.

3.9 No Implied Licenses. No license or other right is or shall be created or granted hereunder by implication, estoppel or otherwise. All licenses and rights are or shall be granted only as expressly provided in this Agreement. All rights not expressly granted by a Party under this Agreement are reserved by such Party and may be used by such Party for any purpose. For clarity, there shall be no implied license or implied other right in favor of Codexis to any Enzyme, and there shall be no implied license or implied other right in favor of Merck to any Technology or Intellectual Property Rights of Codexis that is not expressly addressed in this Agreement.

4. SERVICES

4.1 Evolution Programs. In addition to, and not in lieu of, the Technology Transfer, Codexis shall provide to Merck, [***] into the data and decision matrix/process of Codexis for [***] evolution programs dedicated to Merck during the fifteen (15) month period commencing with the Effective Date at Codexis' facility in Redwood City, California (each an "**Evolution Program**"). [***] Codexis' only obligation with respect to Evolution Program(s) is to perform such Evolution Program(s) in good faith and to provide services of its personnel. Codexis makes no warranty that the Evolution Programs will result in any level of success. All Evolution Programs will conclude, if not earlier completed, on the date which is fifteen (15) months after the Effective Date. At any time during this fifteen (15) month period, [***]. Merck and Codexis previously entered into that certain [***] and [***] (each an "**Existing [***]**" and collectively the "**Existing [***]**"). Should Merck

decide to transfer the subject of work from an Existing [***] to either (a) a Technology Transfer Project or (b) an Evolution Program, then from the date such transfer becomes effective the terms and conditions of this Agreement shall apply to such work in substitution for the terms and conditions of the Existing [***].

4.2 Additional Services. At any time during the Term, Codexis and Merck may mutually agree for Codexis to perform additional enzyme evolution related services for the benefit of Merck, with the scope, deliverables, fees, and conduct of the Parties with respect to such additional services to be set forth in a mutually agreeable statement of work (each, a "**Statement of Work**") in a form substantially similar to that attached as Exhibit 4.2. All Additional Services, and the performance thereof by Codexis, will be subject to the terms and conditions of this Agreement. All Additional Services shall be performed [***] by Codexis. Without limiting the foregoing, Codexis will [***] to accomplish the Additional Services in accordance with any applicable Statement of Work and the terms of this Agreement.

4.3 Subcontracting. Subject to Merck's compliance with Section 3.3 and Codexis' prior written consent, such consent not to be unreasonably withheld, conditioned or delayed, Merck may perform any of its obligations or exercise any of its rights under this Agreement through one or more Third Party contractors, contract manufacturing organizations (CMOs), contract research organizations (CROs) or other contract service organizations, *provided, however*, Merck may not subcontract any activities to a Third Party that would permit such a Third Party to receive and/or use the Platform Technology. Subject to Codexis' compliance with Section 3.3, and Merck's prior written consent, such consent not to be unreasonably withheld, conditioned or delayed, Codexis may perform any of its obligations under Technology Transfer Project 1 (as described in the Technology Transfer Plan) and Technology Transfer Project 2 (as described in the Technology Transfer Plan) and Article 4 through one or more Third Party contractors, contract service organizations and academic or government collaborators; *provided* that the activities corresponding to such obligations [***]. Merck hereby approves the use by Codexis of the subcontractors set forth on Exhibit 4.3.

5. JOINT STEERING COMMITTEE; PATENT COMMITTEE.

5.1 Joint Steering Committee Establishment. Within thirty (30) days after the Effective Date, the Parties shall establish a joint steering committee (the "**Joint Steering Committee**" or "**JSC**") to have overall responsibility for managing and directing the Technology Transfer and Additional Services and to oversee and make certain decisions regarding the Technology Transfer and the Additional Services. The JSC shall also provide a forum for sharing advice, progress and results relating to the activities conducted by the Parties and shall attempt to facilitate the resolution of any disputes between the Parties. At each meeting of the JSC, each Party shall brief the JSC regarding the content, execution and results achieved by such Party with respect to the Technology Transfer and Additional Services. Each Party, through its representatives on the JSC, shall be permitted to provide advice and commentary with respect to the Technology Transfer and Additional Services. The JSC shall have the following specific responsibilities:

5.1.1 oversee, review and provide advice regarding the overall progress of the Technology Transfer and any Additional Services;

5.1.2 coordinate by way of each Party's Scientific Leads the research activities under a written research plan relating to a Technology Transfer Project agreed by the Parties and coordinate sharing of results and data arising therefrom;

5.1.3 appoint and oversee subcommittees as it deems appropriate for carrying out activities under this Agreement, including for oversight of any specific aspects of any portion of the Technology Transfer, Additional Services, or other matters;

5.1.4 review the Technology Transfer Plan and any Statements of Work and, if appropriate, propose modifications thereto to the Parties; and

5.1.5 perform any other activities or functions as the Parties may mutually agree in writing.

5.2 Membership; Meetings. The JSC shall be composed of two (2) employees from each of Merck and Codexis and shall meet, in person, by teleconference, or by video-teleconference, at least one (1) time per Calendar Quarter, or more or less often as the Parties shall determine; *provided* that nothing under this Agreement shall prevent the Parties from meeting in person, by teleconference, or by video-teleconference more frequently as may be mutually agreed by the JSC representatives. In-person meetings shall alternate between Codexis and Merck locations within the United States whenever possible unless otherwise agreed by the Parties. The first such meeting shall be within forty-five (45) days after the Effective Date. Any member of the JSC may

designate a substitute, who shall be an employee of the applicable Party, to attend with prior written notice to the other Party. Ad hoc guests who are subject to written confidentiality obligations at least as stringent as the provisions in Article 10 may be invited to JSC meetings. Each Party may replace its JSC members with other of its employees, at any time, upon written notice to the other Party.

5.3 Decision-Making; Limitations on JSC. Decisions of the JSC shall be made by consensus, including issues concerning technical feasibility and the deployment of Codexis resources, with each Party having collectively one (1) vote in all decisions. The JSC shall have only such powers as are specifically delegated to it in this Agreement, and such powers shall be subject to the terms and conditions set forth herein. Without limiting the generality of the foregoing, the JSC shall have no power to amend this Agreement, the Technology Transfer Plan, or any Statement of Work. The Parties shall be alternately responsible for preparing and circulating minutes, for approval by the non-preparing Party, within fourteen (14) days after each meeting including but not limited to a list of topics of discussion at the meeting and a list of any actions, decisions or determinations approved and a list of any issues and actions to be resolved. If the JSC is unable to reach a consensus decision on a matter that is within its decision-making authority within thirty (30) days after it has met and attempted to reach such decision, then such matter shall be resolved in accordance with Article 13. Any matter not expressly provided for hereunder and any matter relating to any Merck Background IP, Merck Developed API, Therapeutic Products, Platform Technology (other than certain Improvements with respect thereto), Licensed IP (other than certain Improvements with respect thereto), or Codexis Background IP (other than certain Improvements with respect thereto) shall remain outside of the scope of the JSC.

5.4 Duration of JSC. The JSC shall be automatically disbanded upon the TT Term Expiration or the earlier termination of this Agreement; *provided* that the Parties may, by mutual written agreement, extend the term of the JSC for additional one (1) year periods after the expiration of the TT Term with a separate mutual written agreement required for each such one (1) year extension.

5.5 Patent Committee

5.5.1 Establishment. Within sixty (60) days after the Effective Date, the Parties shall establish a Patent committee (the "**Patent Committee**") to discuss, oversee and coordinate the Prosecution (or abandonment) of Patents, enforcement of Patents, and defense against claims of infringement of Third Party patents relating to Intellectual Property licensed under Article 3, Sections 2.2.3, 3.5 and 3.7, including for example Codexis Core Technology Improvements IP, Arising Codexis Enzyme Technology IP, Arising Codexis Process Technology IP, Arising Merck Enzyme Technology IP and Arising Merck Process Technology IP, and any related Intellectual

Property matters regarding any Inventions made during the Term, including for example, the Licensed Additional Codexis Patents and the Licensed Additional Codexis Know-How; and to provide recommendations to the Parties regarding the Prosecution of such Patents and related Intellectual Property matters. Within thirty (30) days after the end of each half year, each Party shall provide the Patent Committee with a report listing all Patents relating to such Parties' utilization of the Platform Technology filed by that Party during that half year.

5.5.2 Membership; Meetings. The Patent Committee shall be composed of one (1) employee from each of Merck and Codexis knowledgeable in U.S. patent law and the technology areas that are the subject of this Agreement. The Patent Committee shall meet, in person, by teleconference, or by video-teleconference, at least one (1) time per Calendar Quarter, or more or less often as the Parties shall determine. In-person meetings shall alternate between Codexis and Merck locations within the United States whenever possible unless otherwise agreed by the Parties. The first such meeting shall be within ninety (90) days after the Effective Date. Any member of the Patent Committee may designate a substitute, who shall be an employee of the applicable Party, to attend with prior written notice to the other Party. Ad hoc guests who are subject to written confidentiality obligations at least as stringent as the provisions in Article 10 may be invited to Patent Committee meetings. Each Party may replace its Patent Committee members with other of its employees with the qualifications set forth in this Section 5.5.2, at any time, upon written notice to the other Party.

5.5.3 Decision-Making; Limitations on Patent Committee. Decisions of the Patent Committee shall be made by consensus, with each Party having collectively one (1) vote in all decisions. The Patent Committee shall have only such powers as are specifically delegated to it in this Agreement and such powers shall be subject to the terms and conditions set forth herein. Without limiting the generality of the foregoing, the Patent Committee shall have no power to amend this Agreement, the Technology Transfer Plan or any written research plan. If the Patent Committee is unable to reach a consensus decision on a matter that is within its decision-making authority within thirty (30) days after it has met and attempted to reach such decision, then either Party may refer such matter for resolution by the executive officers designated by the Parties for attempted resolution pursuant to Section 13.1. In the event that the executive officers of each Party are unable to resolve such matter within the time period specified in Section 13.1, then Codexis shall have final decision-making authority with respect to any dispute relating specifically to Restricted Enzymes and Codexis Patents and Merck shall have final decision-making authority with respect to any dispute relating specifically to Merck Patents. The Patent Committee shall provide status updates to the JSC once per Calendar Quarter as long as the JSC is in existence and, thereafter, to the Parties.

5.5.4 Duration of Patent Committee. The Patent Committee shall endure for the Term and, by mutual agreement, beyond the Term.

6. INTELLECTUAL PROPERTY

6.1 Background Rights. Each Party shall retain all right, title and interest to its Background IP, and, except as expressly set forth in this Agreement, no right or license to Patents or other Intellectual Property Rights is granted by either Party to the other Party.

6.2 Inventorship; Ownership of Technology.

6.2.1 Generally. Inventorship of Inventions and ownership of any other Technology shall be determined by Applicable Law. Subject to and except as set forth in Sections 6.2.2 through 6.2.9, all patentable Inventions invented solely by or on behalf of either Party or jointly by or on behalf of both Parties under this Agreement, and all Intellectual Property Rights therein, shall be owned in accordance with inventorship.

6.2.2 Codexis Core Technology Improvements IP. Codexis shall own any and all Codexis Core Technology Improvements and Codexis Core Technology Improvements IP. Merck hereby assigns to Codexis all of Merck's right, title and interest in and to the Codexis Core Technology Improvements IP.

6.2.3 Arising Codexis Enzyme Technology IP. Codexis shall own any and all Arising Codexis Enzyme Technology and Arising Codexis Enzyme Technology IP. Merck hereby assigns to Codexis all of Merck's right, title and interest in and to the Arising Codexis Enzyme Technology IP.

6.2.4 Arising Merck Enzyme Technology IP. Merck shall own any and all Arising Merck Enzyme Technology and Arising Merck Enzyme Technology IP. Codexis hereby assigns to Merck all of Codexis' right, title and interest in and to the Arising Merck Enzyme Technology IP.

6.2.5 Arising Codexis Process Technology IP. Codexis shall own any and all Arising Codexis Process Technology and Arising Codexis Process Technology IP. Merck hereby assigns to Codexis all of Merck's right, title and interest in and to the Arising Codexis Process Technology IP.

6.2.6 Arising Merck Process Technology IP. Merck shall own any and all Arising Merck Process Technology and Arising Merck Process Technology IP. Codexis hereby

assigns to Merck all of Codexis' right, title and interest in and to the Arising Merck Process Technology IP.

6.2.7 Merck API Process Technology IP. Merck shall own any and all Merck API Process Technology and Merck API Process Technology IP. Codexis hereby assigns to Merck all of Codexis' right, title and interest in and to the Merck API Process Technology IP.

6.2.8 Merck Core Technology Improvements IP. Codexis shall own any and all Merck Core Technology Improvements and Merck Core Technology Improvements IP. Merck hereby assigns to Codexis all of Merck's right, title and interest in and to the Merck Core Technology Improvements IP.

6.2.9 Ownership of Enzymes. As between the Parties, (i) Merck shall exclusively own all Enzymes (and any Technology and Intellectual Property Rights related thereto) derived solely from Merck's use of the Platform Technology pursuant to this Agreement and (ii) Codexis shall exclusively own all Enzymes (and any Technology and Intellectual Property Rights related thereto) not derived solely from Merck's use of the Platform Technology pursuant to this Agreement.

6.3 Further Assurances. Each Party and its Affiliates shall sign and deliver to the other Party all writings and do all such things as may be necessary or appropriate to vest in such other Party all right, title and interest in and to all Codexis Core Technology Improvements IP, Merck Core Technology Improvements, Arising Codexis Enzyme Technology IP, Arising Merck Process Technology IP, and Merck API Process Technology IP in accordance with Section 6.2.

6.4 Employees and Agents. Each Party shall ensure that all employees, agents, consultants, contractors and permitted subcontractors performing activities under or contemplated by this Agreement, have assigned or are obligated to assign their interest in any Invention invented in the course of such activities to the Party for which such employee, agent, consultant, contractor or subcontractor is providing its services.

6.5 Prosecution of Patents.

6.5.1 In General. The Patent Committee shall have oversight regarding the Prosecution of Patents disclosing and/or claiming Inventions directly related to Codexis Core Technology Improvements, Merck Core Technology Improvements, Arising Merck Enzyme Technology, Arising Merck Process Technology, Arising Codexis Enzyme Technology, and Arising Codexis Process Technology, and shall provide recommendations to the Parties to maximize the value of such Patents. To the extent necessary, the Parties agree to cooperate in good faith to

coordinate the Prosecution of such Patents, including submissions of Patent applications worldwide (e.g., to coordinate the filing of Patent applications to ensure that the Parties file related applications on the same day). The Parties shall agree in good faith on a strategy with respect to Prosecution of any Patents disclosing and/or claiming any jointly-owned Inventions.

6.5.2 Codexis Prosecution. As between the Parties, Codexis shall have the sole right, but not the obligation, to Prosecute all Patents disclosing and/or claiming all Codexis Core Technology, Merck Core Technology Improvements, Codexis Core Technology Improvements, Codexis Enzymes, Codexis Libraries, Arising Codexis Enzyme Technology and Arising Codexis Process Technology (the "**Codexis Patents**"), in Codexis' sole discretion and at Codexis' sole cost and expense.

6.5.3 Merck Prosecution. As between the Parties, Merck shall have the sole right, but not the obligation, to Prosecute all Patents disclosing and/or claiming all Arising Merck Enzyme Technology and Arising Merck Process Technology (collectively, the "**Merck Patents**"), in Merck's sole discretion and at Merck's sole cost and expense.

6.5.4 Back-Up Rights. If Merck decides not to Prosecute, or not to continue Prosecuting, any Merck Patents, Merck shall provide Codexis with written notice of such decision at least forty-five (45) days prior to the date upon which the subject matter of such Merck Patent shall lapse or become abandoned. The basis for such decision shall be discussed by the Patent Committee pursuant to Section 6.5.1 and Codexis shall thereupon have the right (but not the obligation) to assume responsibility for Prosecution of such Merck Patent at Codexis' expense, and with counsel of Codexis' choosing. Effective upon the date Codexis assumes responsibility for Prosecution of such Merck Patent, and the costs and expenses relating thereto, Merck hereby assigns any and all interest held by Merck in, to, and under such Merck Patent to Codexis.

6.5.5 CREATE Act. Each Party acknowledges and agrees that this Agreement is a "joint research agreement" as contemplated by 35 U.S.C. § 102(c), and that all inventions arising under this Agreement are intended to have the benefit of the rights and protections conferred by the Cooperative Research and Enhancement Act of 2004 ("CREATE Act"). Each Party agrees to disclose the names of both Parties in each Patent application for all inventions arising under all Technology Transfer Projects in accordance with the requirements of 35 U.S.C. § 102(c)(3).

6.6 Enforcement of Patents.

6.6.1 Notice. If either Party becomes aware of any suspected infringement of any Codexis Patent or Merck Patent, or any Codexis Patent or Merck Patent is challenged in any

action or proceeding (any of the foregoing, an "**Infringement Action**"), such Party shall notify the other Party's representative on the Patent Committee, and following such notification, the Parties shall confer.

6.6.2 Enforcement. As between the Parties, Merck will have the first right, but not the obligation, to bring any Infringement Action with respect to any Merck Patent at its sole cost and expense, and Codexis shall have the sole right, but not the obligation, to bring any Infringement Action with respect to any Codexis Patent at its sole cost and expense.

6.6.3 Procedure for Enforcement.

(a) The non-enforcing Party pursuant to Section 6.6.2 shall reasonably assist the enforcing Party (at the enforcing Party's expense) in any Infringement Action if so requested, such assistance to be coordinated through the Parties' Patent Committee members, and the non-enforcing Party shall lend its name and be joined as a party plaintiff to such action if reasonably requested by such enforcing Party or required by Applicable Law. The non-enforcing Party shall have the right to participate and be represented in any such action by its own counsel at its own expense. The non-enforcing Party shall cooperate, at the enforcing Party's cost and expense, with the enforcing Party in investigating or terminating any suspected infringement, whether through legal action, negotiation or otherwise, including by producing all reasonably pertinent records, papers, information, samples, specimens and similar items, and directing its employees to testify and grant interviews, upon the request of the enforcing Party. The enforcing Party will keep the non-enforcing Party reasonably informed of the status of the action through the enforcing Party's Patent Committee members.

(b) A settlement, consent judgment or other voluntary final disposition of a suit under this Section 6.6.3 may be entered into by the enforcing Party without the consent of the non-enforcing Party; *provided* that any such settlement, consent judgment or other disposition of any action or proceeding by an enforcing Party under this Article 6 shall not, without the consent of the non-enforcing Party (not to be unreasonably withheld), (a) impose any liability or obligation on the non-enforcing Party, (b) include the grant of any license, covenant or other rights to any Third Party that would conflict with or reduce the scope of the subject matter included under the licenses granted to the non-enforcing Party under this Agreement, (c) conflict with or reduce the scope of the subject matter claimed in any Patent owned by the non-enforcing Party, or (d) adversely affect the interest of the non-enforcing Party in any material respect.

6.6.4 Damages. In the event that a Party exercises the rights conferred in this Section 6.6, and such Party recovers any damages or other sums in such action or in settlement

thereof, such damages or other sums recovered shall first be applied to all out-of-pocket costs and expenses incurred by the Parties in connection therewith, including attorneys' fees. If such recovery is insufficient to cover all such costs and expenses of both Parties, it shall be shared in proportion to the total of such costs and expenses incurred by each Party. If, after such reimbursement of the Parties' costs and expenses, any funds shall remain from such damages or other sums recovered, such remaining funds shall be retained by the prosecuting Party.

6.7 Defense Against Third Party Intellectual Property Rights.

6.7.1 Claims of Infringement Relating to Therapeutic Products or Merck Developed API. If a Third Party asserts, or either Party becomes aware of a Third Party's intention to assert, that any Intellectual Property Rights owned or otherwise controlled by the Third Party are infringed by the manufacture, use, sale, offer for sale, import or export of a Therapeutic Product or Merck Developed API in the Territory, the Party first obtaining knowledge of such a claim shall immediately provide the other Party notice of such claim along with the related facts in reasonable detail. In such event, unless the Parties otherwise agree, as between the Parties, Merck shall have the sole right, but not the obligation, at its expense, to control the defense of such claim with respect to such Therapeutic Product or Merck Developed API, subject to Codexis' indemnification obligations set forth in Section 11.1.2 and the obligation for Codexis to assume such defense if requested by Merck. Codexis shall cooperate with Merck in Merck's defense of any such claim at Merck's reasonable request and expense, and Codexis shall have the right to be represented separately by counsel of its own choice, but at its own expense. Notwithstanding anything to the contrary in this Agreement, Merck shall also control settlement of such claim; *provided, however*, that no settlement shall be entered into without the prior consent of Codexis, such consent not to be unreasonably withheld or delayed.

6.7.2 Claims of Infringement Relating to Licensed Rights. If a Third Party asserts, or either Party becomes aware of a Third Party's intention to assert, that a Patent owned or otherwise controlled by the Third Party is infringed by the exercise by Merck or its Affiliates of any rights licensed to Merck hereunder (other than by the manufacture, use, sale, offer for sale, import or export of a Therapeutic Product or Merck Developed API in the Territory), the Party first obtaining knowledge of such a claim shall immediately provide the other Party notice of such claim along with the related facts in reasonable detail. In such event, unless the Parties otherwise agree, as between the Parties, Codexis shall have the sole right, but not the obligation, at its expense, to control the defense of such claim. Merck shall cooperate with Codexis in Codexis' defense of any such claim at Codexis' reasonable request and expense, and Merck shall have the right to be represented separately by counsel of its own choice, but at its own expense. Notwithstanding anything to the

contrary in this Agreement, Codexis shall also control settlement of such claim; *provided, however,* that no settlement shall be entered into without the prior consent of Merck if such settlement would adversely affect the rights and benefits of, or impose or adversely affect any obligations on, Merck, such consent not to be unreasonably withheld or delayed.

7. FINANCIAL TERMS

7.1 Upfront Payment. In consideration of the Technology Transfer and licenses granted to Merck under this Agreement, within [***] after the Effective Date, Merck shall pay to Codexis a non-creditable, non-refundable upfront payment of five million Dollars ($5,000,000).

7.2 Option Fee. Upon each exercise of an Option, as set forth in Section 3.5.3, Merck shall pay, within [***] after Merck's receipt of an Invoice from Codexis, the non-creditable, non-refundable payment specified in Section 3.5.3.

7.3 Technology Transfer Milestones. In consideration of the Technology Transfer and licenses granted to Merck under this Agreement, Merck shall pay to Codexis, within [***] of Merck's receipt of an Invoice from Codexis, each of the creditable, non-refundable milestone payments set forth in this Section 7.3 upon achievement of the applicable milestone event.

Technology Transfer Milestone Event	Milestone Payment
Completion of Wave 1	$5,000,000.00
Completion of Wave 2	$8,000,000.00

7.4 Merck Developed API Payments.

7.4.1 Following Regulatory Approval of a Fee Bearing Therapeutic Product, Merck shall pay to Codexis the following amounts based on [***] of each Merck Developed API(s) manufactured using at least one (1) Enzyme by or for Merck, its Affiliates or its or their permitted licensees, successors, assignees or transferees (in accordance with Sections 3.4.3 or 14.8) for use, intended for use or usable in a Fee Bearing Therapeutic Product, on a Merck Developed API manufactured using at least one (1) Enzyme by Merck Developed API manufactured using at least one (1) Enzyme basis ("[***] Payment"):

[***] Merck Developed API manufactured using at least one (1) Enzyme	[***] Payment
[***]	$[***]
[***]	$[***]

The event triggering the obligation of Merck to make a [***] Payment to Codexis shall be the manufacture of a Merck Developed API manufactured using at least one (1) Enzyme, notwithstanding that (i) the Merck Developed API manufactured using at least one (1) Enzyme may be placed into inventory for intended future use, (ii) Merck, its Affiliates or its or their permitted licensees, successors, assigns or transferees have not specifically identified the Merck Developed API manufactured using at least one (1) Enzyme in question as being intended for use in a particular lot of Fee Bearing Therapeutic Product, and/or (iii) Merck, its Affiliates or its or their permitted licensees, successors, assigns or transferees have not manufactured or sold the Fee Bearing Therapeutic Product. Notwithstanding the foregoing, in no event will the total, cumulative [***] Payments payable to Codexis for any Merck Developed API manufactured using at least one (1) Enzyme, regardless of the number of Therapeutic Products such Merck Developed API manufactured using at least one (1) Enzyme is used, intended for use, or usable in, exceed fifteen million Dollars ($15,000,000). For clarity, the amounts payable to Codexis based on the Merck Developed API manufactured using at least one (1) Enzyme are and shall be deemed to be unaffected by the number of Enzymes used, intended for use, or usable in the manufacture of such Merck Developed API manufactured using at least one (1) Enzyme.

7.4.2 During the Term, within [***] after the end of each Calendar Year, Merck shall deliver to Codexis a written notice identifying each (a) Fee Bearing Therapeutic Product and the Merck Developed API contained within each Fee Bearing Therapeutic Product and (b) Therapeutic Product (and the Merck Developed API contained within each such Therapeutic Product) that (i) is in active development by Merck, its Affiliates or a permitted licensee or assign and (ii) is being evaluated or has been evaluated in a Phase III Clinical Trial. During the Term, Codexis may from time to time request from Merck to confirm to Codexis whether a specific Therapeutic that (i) is in active development by Merck, its Affiliates or a permitted licensee or assign and (ii) is being evaluated or has been evaluated in a Phase III Clinical Trial is manufactured using an Enzyme, and Merck will respond in writing within a reasonable time to such written request from Codexis.

7.5 Payment Reports. Beginning after the first Regulatory Approval of a Fee Bearing Therapeutic Product, and at all times thereafter during the Term so long as Merck, its

Affiliates or its permitted licensees, successors, assignees or transferees is manufacturing a Fee Bearing Therapeutic Product, Merck shall furnish to Codexis a written report, within [***] after the end of each Calendar Quarter, showing the amount of [***] Payments due for such Calendar Quarter pursuant to Section 7.4. At the same time each payment report is issued, Merck shall issue Codexis a purchase order for the [***] Payments totaled in each payment report (itemized for each Merck Developed API). The foregoing report shall include:

(a) identification of each Fee Bearing Therapeutic Product containing a Merck Developed API and the Enzyme(s) used in such Merck Developed API;

(b) [***] of each Merck Developed API manufactured during the reporting period for use, for intended use, or usable in each Fee Bearing Therapeutic Product, as well as the cumulative total [***] of such Merck Developed API manufactured for use, intended use, or usable in each Fee Bearing Therapeutic Product;

(c) the amount payable in Dollars which shall have accrued hereunder in respect of each such [***] of Merck Developed API and the basis for calculating such amounts, as well as the cumulative total amount payable in Dollars which shall have been accrued hereunder in respect of such Merck Developed API;

(d) withholding Taxes, if any, required by Applicable Law to be deducted in respect of such amounts.

The report shall be accompanied by a copy of [***].

7.6 Manner of Payment. All Agreement Payments shall be made in Dollars by wire transfer of immediately available funds to such U.S. bank account as shall be designated by Codexis; *provided, however*, that any notice by Codexis of a change in such account shall not be effective until [***] after receipt thereof by Merck.

7.7 Right of First Refusal for Enzyme Supply. Subject to the limitations in this Agreement (including this Section 7.7), and solely in the event Merck or its Affiliate(s) wish to accept a bona fide offer from a specific, qualified Third Party to supply Enzymes for Merck Developed APIs, Codexis shall have a right of first refusal, solely during the ROFR Period for a specific Therapeutic Product, to [***] supply Merck and its Affiliate(s) their required quantities of Enzyme(s) for those Merck Developed API(s) that are solely for use in such Therapeutic Product(s). A "bona fide offer," for purposes of this Section 7.7, must [***]. The foregoing right [***]. Prior to entering into any agreement with Codexis for the supply of Enzymes, and prior to obtaining supply of any Enzyme from Codexis, Merck shall [***]. If Codexis [***]. For clarity, [***]. For purposes of

clarity, nothing in this Agreement will (1) limit or abridge in any respect the rights and obligations of the Parties under the Sitagliptin Agreement, or (2) limit or restrict in any way Merck's ability or the ability of any of Merck's Affiliates to self-produce (whether at a Merck facility or facilities, or at a facility or facilities of any of Merck's Affiliates) any Enzymes for Merck Developed APIs. Should Merck or its Affiliates at any time [***]

[***].

7.8 Taxes.

7.8.1 Merck will make all payments to Codexis under this Agreement without deduction or withholding for taxes, except to the extent that any such deduction or withholding is required by Applicable Law in effect at the time of payment.

7.8.2 Any tax required to be withheld on amounts payable under this Agreement shall be paid promptly by Merck on behalf of Codexis to the appropriate governmental authority, and Merck will furnish Codexis with proof of payment of such tax. Any such tax required to be withheld will be borne by Codexis.

7.8.3 Merck and Codexis will cooperate with respect to all documentation required by any taxing authority or reasonably requested by Merck to secure a reduction in the rate of applicable withholding taxes. Within [***] after the execution of this Agreement, Codexis will deliver to Merck an accurate and complete Internal Revenue Service Form W-9.

7.8.4 If Merck had a duty to withhold taxes in connection with any payment it made to Codexis under this Agreement but Merck failed to withhold, and such taxes were assessed against and paid by Merck, then Codexis will reimburse Merck for such taxes (plus interest) actually paid by Merck. If Merck makes a claim under this Section 7.8.4, it will comply with the obligations imposed by Section 7.8.2 as if Merck had withheld taxes from a payment to Codexis.

7.9 Interest Due. Without limiting any other rights or remedies available to either Party, Merck shall pay to Codexis interest on any payments that are not paid on or before the date such payments are due under this Agreement at a rate equal to the lesser of (a) [***] the 1-year LIBOR rate on the date such payment was due to be paid or (b) the maximum applicable legal rate on such date, in either (a) or (b), calculated on the total number of days payment was delinquent.

7.10 Payment Terms. On a quarterly basis, Codexis shall submit an invoice to Merck upon receipt of each payment report and purchase order issued pursuant to Section 7.5. Upon receipt of a valid invoice from Codexis, Merck shall make net payment to Codexis within [***].

7.11 Reconciliation. In the event that Merck is determined, as a consequence of an audit conducted by Codexis pursuant to Article 8, to have either:

(a) not paid to Codexis any Agreement Payments with respect to a Merck Developed API for which Agreement Payments are payable; or

(b) underpaid any amounts by more than [***] of the undisputed amounts that should have been paid to Codexis;

(c) whether in the case of (a) or (b), for each occurrence after the first occurrence that Merck is determined, as a consequence of a separate, independent audit conducted by Codexis pursuant to Section 8.2.1 to have:

(i) not paid to Codexis any Agreement Payments with respect to a Fee Bearing Therapeutic Product for which Agreement Payments are payable; or

(ii) underpaid any amounts by more than [***] of the undisputed amounts that should have been paid to Codexis;

Merck shall pay to Codexis, within [***] from invoice by Codexis, (A) the outstanding amount due to Codexis as determined under this Section 7.11, (B) interest due in respect of the amount noted in (A) as determined pursuant to Section 7.9; and (C) the amount calculated to be [***] of the amount noted in (A) above.

8. RECORDS RETENTION AND AUDIT RIGHTS

8.1 Records Retention. Merck shall keep, and shall cause each of its Affiliates to keep, complete and accurate records (books of accounting shall be maintained in accordance with U.S. GAAP), for the following periods:

(a) for purposes of verifying Merck's and its Affiliates' compliance with Article 3, Section 7.4 and Section 7.7, for the immediately preceding [***]; and

(b) for purposes of verifying the accuracy of payment reports and purchase orders submitted by Merck (for its own behalf, and on behalf of its Affiliates and Third Party licensees, successors, transferees and assignees) pursuant to Section 7.5, for a period of [***] after the Calendar Year during which the payment report (and supporting documentation) and purchase order were issued.

As Merck is responsible for the payment of [***] Payments due under Section 7.4 and for submitting payment reports and purchase orders pursuant to Section 7.5 for Merck Developed API(s) manufactured by or for permitted Third Party licensees, successors, assignees and transferees, Merck shall be responsible for collecting from permitted Third Party licensees, successors, assignees and transferees and maintaining for the periods set forth in this Section 8.1 all books and records that are reasonably necessary for Merck to demonstrate compliance with Sections 7.4 and 7.5.

8.2 Audit Rights.

8.2.1 Upon the written request of Codexis and not more than [***] in each Calendar Year, Merck shall permit Codexis, through its authorized representatives (as described in Section 8.2.2) to audit Merck's and its Affiliates' compliance with Article 3, Section 7.4, Section 7.7 and/or to verify the accuracy of payment reports (and supporting documentation) and purchase orders submitted by Merck pursuant to Section 7.5. For the avoidance of doubt, Codexis' exercise of its audit rights set forth above shall be limited to [***], whether it exercises its rights to audit all or any part of the areas of compliance which are subject to audit. Once an audit is complete (including any extensions of the audit to allow for investigation of issues revealed by the audit), Codexis shall [***].

8.2.2 All such audit(s) shall be conducted by an independent certified public accounting firm [***] selected by Codexis and reasonably acceptable to Merck (using, as appropriate, reputable subject matter experts for non-financial matters) and at Codexis' expense (subject to Section 8.2.6 below). All such audits shall be conducted during normal business hours and upon reasonable advance notice and shall be limited to the books and records of Merck and its Affiliates reasonably related to the area of inquiry. Codexis shall treat all such records subject to review under this Section 8.2.2 in accordance with the confidentiality and non-use provisions of this Agreement, and shall cause its accounting firm (and associated experts) to enter into an acceptable confidentiality agreement with Merck obligating it to retain all such information in confidence pursuant to such confidentiality agreement.

8.2.3 All such audit(s) shall be limited to the applicable time periods specified in Section 8.1.

8.2.4 To the extent the audit is directed at Merck's and/or its Affiliates' compliance with Section 7.4, results of such investigation shall be made available to both Merck and Codexis; *provided* that such designee shall disclose to Codexis only its determination of whether the product constitutes a Fee Bearing Therapeutic Product and shall disclose no other information revealed in such investigation to Codexis. Any materials examined by such designee shall be deemed Merck's Information, which may not be disclosed by such designee to any Third Party. If, as a result

of any such investigation, such designee determines that such product constitutes a Fee Bearing Therapeutic Product, then Merck shall (a) make all payments required to be made to Codexis under Section 7.4 with respect to such Fee Bearing Therapeutic Product that occurred prior to the date the Parties received such results within [***] after the date the Parties received such results, and shall be responsible for any such payments with respect to such Fee Bearing Therapeutic Product thereafter and (b) pay interest on all late payments in accordance with Section 7.9.

8.2.5 To the extent the audit is directed at Merck's and/or its Affiliates' compliance with Section 7.5, the report of the independent certified public accounting firm shall be shared with Merck prior to distribution to Codexis such that Merck can provide the independent, certified public accounting firm with justifying remarks for inclusion in the report prior to sharing the conclusions of such report with Codexis. Results of any such examination shall be made available to both Merck and Codexis. The independent, certified public accounting firm shall disclose to Codexis only the amounts that the independent, certified public accounting firm believes to be due and payable hereunder to Codexis and details concerning any discrepancy from the amount paid and the amount due, and shall disclose no other information revealed in such audit. Any and all records examined by such independent, certified public accounting firm shall be deemed Merck's Information, which may not be disclosed by said independent, certified public accounting firm to any Third Party. If, as a result of any inspection of the books and records of Merck, it is shown that payments under this Agreement were less than the amount that should have been paid, then Merck shall (i) make all payments required to be made to Codexis to eliminate any discrepancy revealed by such inspection within [***] and (ii) pay interest on all late payments in accordance with Section 7.9. In the event that the audit demonstrates a net overpayment by Merck, Merck shall withhold such overpayment from future [***] Payments.

8.2.6 Codexis shall pay for such audits, except that in the event that the audited amounts reveal an underpayment, or complete failure to pay with respect to a Merck Developed API for which Agreement Payments are payable, by Merck [***] of the undisputed amounts that should have been paid during the period in question as per the audit, Merck shall pay Codexis' out-of-pocket costs of the audit (including the fees and expenses of the independent, certified public accounting firm).

9. REPRESENTATIONS, WARRANTIES, AND COVENANTS; DISCLAIMERS; LIMITATION OF LIABILITY

9.1 Mutual Representations and Warranties. Each Party represents and warrants to the other Party as of the Effective Date [***], that:

9.1.1 such Party is duly organized, validly existing, and in good standing under the Applicable Law of the jurisdiction of its incorporation and has full corporate power and authority to enter into this Agreement and to carry out the provisions hereof;

9.1.2 execution of this Agreement and the performance by such Party of its obligations hereunder have been duly authorized;

9.1.3 this Agreement has been duly executed and delivered on behalf of such Party, and constitutes a legal, valid, binding obligation of such Party, enforceable against it in accordance with the terms hereof;

9.1.4 the performance of this Agreement by such Party does not create a breach or default under any other agreement to which it is a party, which breach or default would adversely affect the other Party;

9.1.5 the execution, delivery, and performance of this Agreement by such Party does not conflict with any agreement, instrument, or understanding, oral or written, to which it is a party or by which it is bound, nor violate any Applicable Law of any court, governmental body or administrative or other agency having jurisdiction over such Party;

9.1.6 no government authorization, consent, approval, license, exemption, filing or registration with any court or governmental department, commission, board, bureau, agency or instrumentality, domestic or foreign, under any Applicable Law currently in effect, is or will be necessary for, or in connection with, the transaction contemplated by this Agreement or any other agreement or instrument executed in connection herewith, or for the performance by such Party of its obligations under this Agreement and such other agreements, except as may be required to obtain applicable Regulatory Approvals or Regulatory Filings related to the development of any Therapeutic Product; and

9.1.7 with specific regard to each Party's performance of their respective obligations to the other Party under this Agreement, such Party has not employed and, to its knowledge, has not used a contractor or consultant that has employed any individual or entity (a) debarred by the FDA (or subject to a similar sanction of any other applicable Regulatory Authority), (b) who is the subject of an FDA debarment investigation or proceeding (or similar proceeding of any other applicable Regulatory Authority), or (c) has been charged with or convicted under Applicable Law of the United States for conduct relating to the development or approval, or otherwise relating to the regulation of any product under the Generic Drug Enforcement Act of 1992, in each case, in the conduct of its activities prior to the Effective Date.

9.2 Additional Representations and Warranties of Codexis. Codexis, on behalf of itself and its Affiliates, hereby represents and warrants to Merck that, except as otherwise disclosed in writing by Codexis to Merck and accepted in writing by Merck, as of the Effective Date:

9.2.1 [***];

9.2.2 Codexis is the sole and exclusive owner of the Licensed Patents and the Licensed Know-How and has the full authority to grant the full and unencumbered scope of rights and licenses (other than as set forth in Exhibit 1.29) granted to Merck under this Agreement;

9.2.3 to the knowledge of Codexis Senior Management, no licenses under any Third Party Intellectual Property Rights are necessary for Codexis to grant to Merck the licenses hereunder (other than licenses to commercially available software or open source software such as, by way of example only, [***] or [***]);

9.2.4 the Licensed Patents are all of the Patents Controlled by Codexis that are (i) necessary to practice the Platform Technology; and (ii) which Cover the practice of the Platform Technology;

9.2.5 the Licensed Know-How and the In-Licensed Know-How account for all of the Know-How Controlled by Codexis that is (i) necessary to practice the Platform Technology; and (ii) which Cover the practice of the Platform Technology;

9.2.6 neither Codexis nor any of its Affiliates has granted any right, license or interest to any Third Party relating to or under the Licensed IP or to the Platform Technology that would conflict or would otherwise be inconsistent with any of the rights, licenses or interests granted to Merck under this Agreement;

9.2.7 the Licensed Know-How (other than In-Licensed Know How) were generated either by employees or contractors of Codexis, and in each case the terms of employment or engagement of such employees or contractors vested in Codexis all right, title and interest in and to any Know-How generated by them or has obtained or has the legal right to obtain assignments of all such Licensed Know-How;

9.2.8 to the knowledge of Codexis Senior Management, no Third Party has rights in the Licensed Patents, the Licensed Know-How or the Platform Technology that would adversely affect Merck's rights under this Agreement;

9.2.9 [***];

9.2.10 [***];

9.2.11 [***];

9.2.12 in respect of each of the In-License Agreements, to the knowledge of Codexis Senior Management:

(a) each of the In-License Agreements is in full force and effect and neither Codexis nor its Affiliates have materially breached or received any written or oral notice of any breach or any written or oral notice of the intent to terminate under any of the In-License Agreements;

(b) each sublicense granted to Merck has been granted to Merck pursuant to the terms of each respective In-License Agreement;

(c) each of the In-License Agreements disclosed to Merck is true, accurate and not misleading as to the terms thereof that have not been redacted; and

(d) Exhibit 1.60 sets forth a true and complete list of all In-License Agreements;

9.2.13 [***];

9.2.14 the license limitations in Section 3.4.2 with respect to the Codexis Mayflower Patents are exhaustive, complete, accurate and not misleading; and

9.2.15 certain of the inventions claimed in the In-Licensed Patents, the Codexis Core Technology IP and the Intellectual Property Rights therein, have been made with funds provided by the U.S. government, and that with respect thereto the U.S. government retains a non-exclusive license as set forth in 35 U.S.C. § 202 and, as a result, this Agreement is subject to all of the terms and conditions of 35 U.S.C. § 200 et seq., which sets forth additional obligations with regard to inventions made with U.S. government funds and products based thereon, including a preference for manufacture in the U.S. pursuant to 35 U.S.C. § 204.

9.3 Mutual Covenants. Each Party hereby covenants to the other Party that:

9.3.1 all employees of such Party or its Affiliates, and all agents, consultants, contractors and subcontractors (as provided in Section 4.3) of such Party or its Affiliates performing any activities under a research plan under a Technology Transfer Project (including, in the case of Codexis, any Additional Services) shall be under the obligation to assign all right, title and

interest in and to their inventions and discoveries, whether or not patentable, if any, to such Party as the sole owner thereof;

9.3.2 such Party shall perform its obligations and activities under this Agreement (including, in the case of Codexis, the Additional Services) in compliance with Applicable Law and industry standards, including, without limitation, GLP, GCP and GMP, in each case as applicable under Applicable Law of the country and the state and local government wherein such activities are conducted, and with respect to the care, handling and use in research and development activities hereunder of any non-human animals by or on behalf of such Party, shall at all times comply (and shall ensure compliance by any of its subcontractors) with Applicable Law, and also with the standards in the pharmaceutical industry for the development and manufacture of pharmaceutical products, and (b) with individuals who are appropriately trained and qualified;

9.3.3 with specific regard to each Party's performance of their respective obligations to the other Party under this Agreement, neither Party shall employ (or, to its knowledge, use any contractor or consultant that employs) any individual or entity (a) debarred by the FDA (or subject to a similar sanction of any other applicable Regulatory Authority), (b) who is the subject of an FDA debarment investigation or proceeding (or similar proceeding of any other applicable Regulatory Authority), or (c) has been charged with or convicted under any Applicable Law of the United States for conduct relating to the development, approval or otherwise relating to the regulation of any product under the Generic Drug Enforcement Act of 1992, in each case, in the conduct of its activities under this Agreement; and

9.3.4 neither Party shall, during the Term, grant any right or license to any Third Party relating to any of the Intellectual Property Rights it Controls that would conflict or interfere with any of the rights or licenses granted to the other Party hereunder.

9.4 Additional Covenants of Merck. Merck hereby covenants to Codexis that:

9.4.1 all Merck employees and contractors that will have access to Codexis Confidential Information and/or Platform Technology shall be subject to confidentiality obligations with Merck subjecting the employee or contractor to Merck's maintenance, non-disclosure, and non-use obligations under Article 10;

9.4.2 any financial information contained in any Merck report delivered pursuant to Article 7 will be generated using the same financial reporting system, using the same data, and in the same manner that Merck uses to generate financial information for Merck's public reporting obligations; and

9.4.3 during the Term, Merck shall not, and Merck shall cause its Affiliates and its permitted sublicensees to not, challenge the validity, scope or enforceability of or otherwise oppose any Patents included within the Licensed IP in any country[***].

9.5 Additional Covenants of Codexis. Codexis hereby covenants to Merck that:

9.5.1 with respect to each In-License Agreement, Codexis shall maintain and keep each In-License Agreement in full force and effect under each In-License Agreement's respective terms for the term of the In-Licensed IP licensed pursuant to such In-License Agreement;

9.5.2 Codexis shall not amend any such In-License Agreement in a manner that adversely affects Merck's rights under this Agreement and/or imposes any additional obligations upon Merck not disclosed to Merck under the In-License Agreements;

9.5.3 Codexis, pursuant to the terms of the In-License Agreements, shall pay any and all annual license fees due to all Third Party licensors during the Term required to maintain each In-License Agreement; *provided, however*, that nothing contained herein shall require Codexis to be responsible for Losses arising from the breach of any In-License Agreements by Merck as a sublicensee; and

9.5.4 If during the Term Merck [***] concludes that one or more [***] are necessary to [***] during the Term and in the manner contemplated by Section 9.2.1, Merck shall notify Codexis in writing [***]

[***] and Merck and Codexis shall [***]. If the Parties [***]. If the Parties [***]. If the Parties [***]. If the [***]. If the [***]. If the [***]. In no event will the [***].

9.6 DISCLAIMERS

9.6.1 CODEXIS DISCLAIMER. EXCEPT AS EXPRESSLY SET FORTH IN SECTIONS 9.1, 9.2, 9.3 AND 9.5, CODEXIS MAKES NO REPRESENTATIONS, WARRANTIES OR COVENANTS OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ANY CODEXIS INFORMATION, CODEXIS PATENTS, CODEXIS CORE TECHNOLOGY, CODEXIS CORE TECHNOLOGY IMPROVEMENTS, MERCK CORE TECHNOLOGY IMPROVEMENTS, ARISING CODEXIS ENZYME TECHNOLOGY, ARISING CODEXIS PROCESS TECHNOLOGY OR ANY LICENSE GRANTED BY CODEXIS HEREUNDER, OR WITH RESPECT TO THE PRODUCTS. EXCEPT AS EXPRESSLY SET FORTH IN SECTIONS

9.1, 9.2, 9.3 AND 9.5, NOTHING IN THIS AGREEMENT SHALL BE CONSTRUED AS A REPRESENTATION OR WARRANTY THAT ANY PATENT OR OTHER PROPRIETARY RIGHTS INCLUDED IN THE CODEXIS PATENTS ARE VALID OR ENFORCEABLE OR THAT USE OF THE CODEXIS PATENTS, CODEXIS CORE TECHNOLOGY, CODEXIS CORE TECHNOLOGY IMPROVEMENTS, MERCK CORE TECHNOLOGY IMPROVEMENTS, ARISING CODEXIS ENZYME TECHNOLOGY AND ARISING CODEXIS PROCESS TECHNOLOGY CONTEMPLATED HEREUNDER [***].

9.6.2 MERCK DISCLAIMER. EXCEPT AS EXPRESSLY SET FORTH IN SECTIONS 9.1, 9.3 AND 9.4, MERCK MAKES NO REPRESENTATIONS, WARRANTIES OR COVENANTS OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ANY MERCK INFORMATION OR ANY LICENSE GRANTED BY MERCK HEREUNDER. EXCEPT AS EXPRESSLY SET FORTH IN SECTIONS 9.1, 9.3 AND 9.4, NOTHING IN THIS AGREEMENT SHALL BE CONSTRUED AS A REPRESENTATION OR WARRANTY THAT ANY PATENT OR OTHER PROPRIETARY RIGHTS INCLUDED IN THE MERCK BACKGROUND IP, ARISING MERCK ENZYME TECHNOLOGY OR ARISING MERCK PROCESS TECHNOLOGY ARE VALID OR ENFORCEABLE OR THAT THE USE OF THE MERCK BACKGROUND IP, ARISING MERCK ENZYME TECHNOLOGY OR ARISING MERCK PROCESS TECHNOLOGY CONTEMPLATED HEREUNDER [***].

9.6.3 LIMITATION OF LIABILITY. EXCEPT FOR A BREACH OF [***], OR CLAIMS OF A THIRD PARTY THAT ARE SUBJECT TO INDEMNIFICATION UNDER ARTICLE 11, NEITHER PARTY SHALL BE LIABLE TO THE OTHER PARTY WITH RESPECT TO ANY SUBJECT MATTER OF THIS AGREEMENT, WHETHER UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY, FOR ANY INCIDENTAL, INDIRECT, SPECIAL, EXEMPLARY, PUNITIVE, MULTIPLE OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST PROFITS, LOSS OF USE, DAMAGE TO GOODWILL OR LOSS OF BUSINESS.

10. CONFIDENTIALITY

10.1 Nondisclosure Obligation. All Information disclosed by one Party to the other Party hereunder shall, during the Term and for a period of ten (10) years thereafter, be (a) maintained in confidence by the receiving Party and (b) shall not be disclosed to any Third Party or (c) used for any purpose except as permitted by this Agreement (it being understood that this clause

(c) shall not create or imply any rights or licenses not expressly granted under this Agreement) without the prior written consent of the disclosing Party, except to the extent that such Information:

10.1.1 is known by the receiving Party at the time of its receipt, and not through a prior disclosure by the disclosing Party, as documented by the receiving Party's business records;

10.1.2 is in the public domain by use and/or publication before its receipt from the disclosing Party, or thereafter enters the public domain through no fault of the receiving Party;

10.1.3 is subsequently disclosed to the receiving Party by a Third Party who may lawfully do so and is not under an obligation of confidentiality to the disclosing Party; or

10.1.4 is developed by the receiving Party independently of Information received from the disclosing Party, as documented by the receiving Party's business records.

Any combination of features or disclosures shall not be deemed to fall within the foregoing exclusions merely because individual features are published or available to the general public or in the rightful possession of the receiving Party unless the combination itself and principle of operation are published or available to the general public or in the rightful possession of the receiving Party.

10.2 Authorized Disclosure. The receiving Party may disclose Information belonging to the disclosing Party, and Information deemed to belong to both Parties under the terms of this Agreement, to the extent and only to extent) such disclosure is reasonably necessary in the following instances the receiving Party may disclose Information belonging to the disclosing Party, and Information deemed to belong to both Parties under the terms of this Agreement, to the extent and only to extent) such disclosure is reasonably necessary in the following instances:

10.2.1 Prosecuting Patents;

10.2.2 to a Regulatory Authority in order to obtain Patents or to gain or maintain Regulatory Approval, but such disclosure may be only to the extent reasonably necessary to obtain Patents or Regulatory Approval;

10.2.3 prosecuting or defending litigation, including responding to a subpoena in a Third Party litigation;

10.2.4 subject to Section 10.5, complying with Applicable Law (including the rules and regulations of the Securities and Exchange Commission or any national securities

exchange) and with judicial process, if in the reasonable opinion of the receiving Party's counsel, such disclosure is necessary for such compliance; and

10.2.5 disclosure, solely on a "need to know basis," to Affiliates, sublicensees, potential or actual acquirers, merger partners, or assigns permitted under Section 14.8, permitted subcontractors, investment bankers, investors, lenders or other potential financial partners, and their and each of the Parties' respective directors, employees, consultants, contractors and agents, each of whom prior to disclosure must be bound by written obligations of confidentiality and non-use no less restrictive than the obligations set forth in this Article 10; *provided, however*, that in each of the above situations, the receiving Party shall remain responsible for any failure by any Person who receives Information pursuant to this Section 10.2.5 to treat such Information as required under this Article 10.

If and whenever any Information is disclosed in accordance with this Section 10.2, such disclosure shall not cause any such Information to cease to be confidential, except to the extent that such disclosure results in a public disclosure of such Information (other than by breach of this Agreement). Where reasonably possible and subject to Section 10.4 and other than pursuant to Section 10.2.5, the receiving Party shall notify the disclosing Party of the receiving Party's intent to make such disclosure pursuant to this Section.

If a Party is required by judicial or administrative process to disclose Information that is subject to the non-disclosure provisions of this Section 10.2, such Party shall promptly inform the other Party of the disclosure that is being sought in order to provide the other Party an opportunity to challenge or limit the disclosure obligations. Information that is disclosed by judicial or administrative process shall remain otherwise subject to the confidentiality and non-use provisions of this Section 10.2, and the Party disclosing Information pursuant to law or court order shall take all steps reasonably necessary, including without limitation obtaining an order of confidentiality, to ensure the continued confidential treatment of such Information.

10.3 Terms of this Agreement. The Parties acknowledge that this Agreement and all of the respective terms of this Agreement shall be treated as Information of both Parties, except that Exhibits [***] are Information of Codexis.

10.4 Securities. In the event either Party proposes to file with the Securities and Exchange Commission or the securities regulators of any state or other jurisdiction a registration statement or any other disclosure document which describes or refers to the terms and conditions of this Agreement under the Securities Act of 1933, as amended, the Securities Exchange Act of 1934, as amended, or any other securities Applicable Law, the Party shall notify the other Party of such

intention and shall provide such other Party with a copy of the relevant portions of the proposed filing prior to such filing (and any revisions to such portions of the proposed filing a reasonable time prior to the filing thereof), including any exhibits thereto relating to the terms and conditions of this Agreement, and shall use reasonable efforts to obtain confidential treatment of the terms and conditions of this Agreement that such other Party reasonably requests be kept confidential, and shall only disclose Information that it is advised by counsel is legally required to be disclosed. No such notice shall be required under this Section 10.4 if the description of or reference to this Agreement contained in the proposed filing has been included in any previous filing made by either Party hereunder or otherwise approved by the other Party.

10.5 Publicity/Use of Names.

10.5.1 Upon execution of this Agreement, Codexis shall issue the press release mutually agreed upon by the Parties and set forth in Exhibit 10.5.1. Any disclosure that is required by Applicable Law (including the Securities Act of 1933, as amended, and the Securities Exchange Act of 1934, as amended), or the rules of a securities exchange or the Securities and Exchange Commission or the securities regulations of any state or other jurisdiction, may be made by Codexis or Merck; *provided* that any such required disclosure will not contain any Information of, respectively, Merck or Codexis and, if disclosure of such information is required by Applicable Law or such rules or regulations, the Parties will comply with Sections 10.2 and 10.5, as applicable, and will use reasonable efforts to minimize such disclosure and obtain confidential treatment for any such information that is disclosed to a governmental agency. Codexis may publicly disclose any information that has previously been disclosed in accordance with this Section 10.5.1 without any requirement to receive Merck's approval thereof or to provide Merck with an opportunity to review such disclosure.

10.5.2 Codexis agrees to provide to Merck a copy of any public announcement regarding this Agreement or the subject matter thereof within a reasonable period of time under the circumstances prior to its scheduled release, which period of time shall not be less than fifteen (15) Business Days where practicable, for Merck's review. Except as otherwise required by Applicable Law, Codexis shall remove any Information of Merck that Merck deems to be inappropriate for disclosure. Codexis agrees not to use the name or trademark of Merck, its Affiliates, or its employees, without the prior written consent of Merck, except that Codexis may disclose that Merck is a licensee of Codexis hereunder.

10.5.3 Merck may make public announcements and publications regarding any Merck Developed API or Therapeutic Product in its sole discretion, and such announcement or publication shall not be subject to this Section 10.5. In addition, Merck may publish scientific papers

and make scientific presentations; *provided, however*, that such publications and presentations do not include the Information of Codexis.

10.6 Existing CDA. The Parties entered into a confidential disclosure agreement dated as of [***] (the "**Confidential Disclosure Agreement**"). If any terms or conditions set forth in this Article 10 conflict with or are inconsistent with the terms and conditions of the Confidential Disclosure Agreement with respect to any information disclosed thereunder that would be considered Information hereunder, this Article 10 will govern over the Confidential Disclosure Agreement with respect to such information to the extent of such conflict or inconsistency. Subject to the foregoing, the Confidential Disclosure Agreement shall remain in full force and effect, in accordance with its terms, with respect to information disclosed thereunder to the extent such information would not be considered Information hereunder.

11. INDEMNITY AND INSURANCE

11.1 Codexis Indemnity.

11.1.1 Codexis shall indemnify, defend and hold harmless Merck and its Affiliates, and their respective officers, directors, employees, agents, licensors, and their respective successors, heirs and assigns, and representatives (the "**Merck Indemnitees**"), from and against any and all Losses from Claims from Third Party(ies), to the extent arising out of or relating to, directly or indirectly: (a) the negligence, recklessness or wrongful intentional acts or omissions of Codexis, its Affiliates, and sublicensees (excluding Merck) and its or their respective directors, officers, employees and agents, in connection with Codexis' performance of its obligations or exercise of its rights under this Agreement, or (b) any breach by Codexis of any representation, warranty or covenant set forth in this Agreement; including for each of clauses (a) and (b), claims and threatened claims based on (i) product liability, bodily injury, risk of bodily injury, death or property damage or (ii) the failure to comply with Applicable Law; *provided, however*, that Codexis' indemnification obligations under this Section 11.1.1 will not apply to any such Losses to the extent (A) such Losses are finally determined by a court or tribunal of competent jurisdiction to be attributable to any Merck Indemnitee having committed an act or acts of negligence, recklessness or willful misconduct, (B) such Losses result from any breach by Merck of any representation, warranty or covenant set forth in this Agreement, or (C) Merck is required to indemnify Codexis pursuant to Section 11.2.

11.1.2 Subject to the limitations set forth in Section 11.1.3, Codexis shall indemnify, defend and hold harmless Merck Indemnitees from and against any and all Losses from Claims from Third Party(ies) [***]; provided, however, that Codexis' indemnification obligations under this Section 11.1.2 will not apply to any such Losses to the extent (A) such Losses are finally

determined by a court or tribunal of competent jurisdiction to be attributable to any Merck Indemnitee having committed an act or acts of negligence, recklessness or willful misconduct, (B) such Losses result from any breach by Merck of any representation, warranty or covenant set forth in this Agreement, or (C) Merck is required to indemnify Codexis pursuant to Section 11.2 for such Losses. [***]

11.1.3 Codexis' indemnification obligations under Section 11.1.2 will be limited as follows: [***].

11.2 Merck Indemnity. Merck shall indemnify, defend, and hold harmless Codexis and its Affiliates, and their respective officers, directors, employees, agents, licensors, and their respective successors, heirs and assigns, and representatives (the "**Codexis Indemnitees**"), from and against any and all Losses from Claims from Third Party(ies) to the extent arising out of or relating to, directly or indirectly: (a) the negligence, recklessness or wrongful intentional acts or omissions of Merck, its Affiliates, and sublicensees and its or their respective directors, officers, employees and agents, in connection with Merck's performance of its obligations or exercise of its rights under this Agreement; (b) any breach by Merck of any representation, warranty or covenant set forth in this Agreement; (c) research, development, synthesis, transfer, handling, storage, sale, use, optimization, modification, isolation, engineering, identification, selection, making, having made, importation, exportation or other disposition of any Merck Developed API or Therapeutic Product by or on behalf of Merck or any of its Affiliates, sublicensees, agents and contractors (other than Codexis) , including for each of clauses (a), (b), and (c) above, claims and threatened claims based on (i) product liability, bodily injury, risk of bodily injury, death or property damage or (ii) the failure to comply with Applicable Law; *provided, however*, that Merck's indemnification obligations under this Section 11.2 will not apply to any such Losses to the extent (A) such Losses are finally determined by a court or tribunal of competent jurisdiction to be attributable to any Codexis Indemnitee having committed an act or acts of negligence, recklessness or willful misconduct, (B) such Losses result from any breach by Codexis of any representation, warranty or covenant set forth in this Agreement, or (C) Codexis is required to indemnify Merck pursuant to Section 11.1.

11.3 Indemnification Procedure. A claim to which indemnification applies under Section 11.1 or Section 11.2 shall be referred to herein as an "Indemnification Claim." If any Person or Person (collectively, the "Indemnitee") intends to claim indemnification under this Article 11, the Indemnitee shall notify the other Party (the "**Indemnitor**") in writing promptly upon becoming aware of any claim that may be an Indemnification Claim (it being understood and agreed, however, that the failure by an Indemnitee to give such notice shall not relieve the Indemnitor of its indemnification obligation under this Agreement, except and only to the extent that the Indemnitor is

actually prejudiced as a result of such failure to give notice). The Indemnitor shall have the right to assume and control the defense of the Indemnification Claim at its own expense with counsel selected by the Indemnitor and reasonably acceptable to the Indemnitee; *provided, however,* that an Indemnitee shall have the right to retain its own counsel, with the fees and expenses to be paid by the Indemnitor, if representation of such Indemnitee by the counsel retained by the Indemnitor would be inappropriate due to actual or potential conflicting interests between such Indemnitee and the Indemnitor; *provided* that the Indemnitor shall not be obligated to pay the fees of more than one counsel retained by all Indemnitees. If the Indemnitor does not assume the defense of the Indemnification Claim as described in this Section 11.3 above, the Indemnitee may defend the Indemnification Claim, but shall have no obligation to do so. The Indemnitee shall not settle or compromise the Indemnification Claim without the prior written consent of the Indemnitor, and the Indemnitor shall not settle or compromise the Indemnification Claim in any manner which would have an adverse effect on the Indemnitee's interests (including any rights under this Agreement), without the prior written consent of the Indemnitee, which consent, in each case, shall not be unreasonably withheld or delayed. The Indemnitee shall reasonably cooperate with the Indemnitor at the Indemnitor's reasonable expense and shall make available to the Indemnitor all pertinent information under the control of the Indemnitee, which information shall be subject to Article 10.

11.4 Insurance. Each Party shall maintain at all times during the Term commercial general liability insurance and product liability insurance in respect of any Claim from a Third Party, as contemplated in Section 11.1.1 and Section 11.2, from a recognized, creditworthy insurance company, with coverage limits of at least [***] per such Claim from such Third Party. With respect to Merck, such product liability insurance shall include coverage for any Claims from Third Party(ies) subject to Section 11.2 in respect of any Merck Developed API or Therapeutic Product undergoing clinical trials. The minimum level of insurance set forth herein shall not be construed to create a limit on either Party's liability hereunder. Within ten (10) days following reasonable written request from either Party, the other Party shall furnish to the requesting Party a certificate of insurance evidencing such coverage. In the case of a material modification or cancellation of such coverage, each Party shall notify the other Party as soon as reasonably practicable and provide the other Party with a new certificate of insurance evidencing that such Party's coverage meets the requirements of this Section 11.4. Notwithstanding the aforementioned, each Party may elect to self-insure or re-insure all of parts of the limits described above and, in such event, this Section 11.4 shall apply to such self-insurance or re-insurance arrangements *mutatis mutandis*.

12. TERM AND TERMINATION.

12.1 Term. This Agreement shall become effective on the Effective Date and shall remain in effect unless and until terminated pursuant to Section 12.2, Section 12.3, Section 12.4 or Section 12.5, or by mutual agreement of the Parties. The period from the Effective Date until the date of termination of this Agreement shall be the "**Term.**"

12.2 Termination for Material Breach. Either Party (the "**Non-Breaching Party**") may, without prejudice to any other remedies available to it at law or in equity, terminate this Agreement, in its entirety, in the Non-Breaching Party's sole discretion in the event the other Party (the "**Breaching Party**") has materially breached this Agreement, and such material breach has continued for sixty (60) days (the "**Cure Period**") after written notice thereof is provided to the Breaching Party by the Non-Breaching Party, such notice describing the alleged material breach in sufficient detail to put the Breaching Party on notice. If at the end of the Cure Period, the Breaching Party can demonstrate that it is actively seeking to remedy such material breach, then at the Breaching Party's request and with the consent of the Non-Breaching Party (not to be unreasonably withheld), the Non-Breaching Party shall grant an additional forty-five (45) days for the Breaching Party to remedy such breach.

12.3 Insolvency or Bankruptcy. To the extent permitted under Applicable Law, either Party may terminate this Agreement, (a) if, at any time, the other Party files in any court or agency pursuant to any statute or regulation of any state or country, a petition in bankruptcy or insolvency or for reorganization or for an arrangement or for the appointment of a receiver or trustee of the Party or of substantially all of its assets, or (b) if the other Party is served with an involuntary petition against it, filed in any insolvency proceeding, and such petition shall not be dismissed within ninety (90) days after the filing thereof, or (c) if the other Party shall propose or be a party to any dissolution or liquidation, or (d) if the other Party shall make an assignment of substantially all of its assets for the benefit of creditors. Each Party agrees to give the other Party prompt notice of the foregoing events giving rise to termination under this Section 12.3. All rights and licenses granted under or pursuant to any section of this Agreement are and shall otherwise be deemed to be for purposes of Section 365(n) of Title 11, United States Code (the "**Bankruptcy Code**") licenses of rights to "intellectual property" as defined in Section 101(35A) of the Bankruptcy Code. The Parties shall retain and may fully exercise all of their respective rights and elections under the Bankruptcy Code. All materials required to be delivered by the non-bankrupt Party under this Agreement (including all manufacturing information) shall be considered to be "embodiments" of such intellectual property for purposes of Section 365(n) of the Bankruptcy Code. Upon the bankruptcy of any Party, the non-bankrupt Party shall further be entitled to a complete duplicate of, or complete access to, any intellectual property licensed to the non-bankrupt Party, and such, if not already in its possession, shall be promptly delivered to the non-bankrupt Party, unless the bankrupt Party elects to

continue, and continues, to perform all of its obligations under this Agreement. All written agreements entered into in connection with the Parties' performance under this Agreement from time to time shall be considered agreements "supplementary" to this Agreement for purposes of Section 365(n) of the Bankruptcy Code.

12.4 Merck Termination at Will. At any time after Wave 1 (and receipt by Codexis of the Milestone Payment associated with the Completion of Wave 1 as contemplated by Section 7.3), Merck may terminate this Agreement in its entirety at any time upon providing ninety (90) days' written notice to Codexis at any time and for any reason or for no reason at all. In such event, Merck shall pay to Codexis all reasonable non-cancellable and non-terminable costs incurred by Codexis upon such event of termination. If Merck terminates this Agreement pursuant to this Section 12.4 prior to receipt by Codexis of the Milestone Payment associated with the Completion of Wave 2 as contemplated by Section 7.3, in addition to the provisions of Section 12.6.2, Merck shall pay to Codexis the applicable termination payment set forth in this Section 12.4.

Termination at Will	Termination At Will Payment
At any time after Wave 1, as defined in the Technology Transfer Plan	$8,000,000.00

12.5 Codexis Special Termination Right. In the event that Merck is determined, [***], as a consequence of an audit conducted by Codexis pursuant to Article 8 (each audit that satisfies the requirements of either clause (a) or (b) of this Section 12.5 is referred to herein as a "**Section 12.5 Event**"), to have either underpaid or completely failed to pay the amounts that should have been paid to Codexis such that Merck is required to pay Codexis' out-of-pocket costs of the audit pursuant to Section 8.2.6, Codexis may[***] terminate this Agreement in its entirety, without a curative period, and regardless of whether Merck can or does cure such failure to pay or underpayment, upon providing thirty (30) days' written notice to Merck. [***]

12.6 Consequences of Termination.

12.6.1 In General. Termination of this Agreement for any reason shall not (a) release either Party from any obligation that has accrued prior to the effective date of such termination; (b) preclude either Party from claiming any other damages, compensation, or relief that it may be entitled to upon such termination; (c) terminate any right to obtain performance of any obligation provided for in this Agreement that shall survive termination; or (d) in any way alter, reduce, diminish, eliminate or expunge either Party's rights set forth in Section 6.2.9, or such Party's right to freely use any Enzymes it owns, post termination. Upon any termination of this Agreement,

each Party shall return to the other Party and cease using all Information of such other Party; *provided* that the legal department of each Party may retain one (1) copy of such Information and the Party having received the Information of the disclosing Party shall not be required to destroy any securely stored computer files that contain the disclosing Party's Information created during automatic system back-ups, *provided* that the Information so retained remains subject to the confidentiality and non-use obligations set forth in this Agreement and the computer files are not readily accessible to the receiving Party's employees.

12.6.2 Effects of Termination.

(a) Upon any permitted termination of this Agreement by Codexis pursuant to Section 12.2, 12.3 or 12.5, or termination by Merck pursuant to Section 12.4, (i) the rights and licenses granted to Merck in Sections [***] shall immediately terminate, and Merck shall, within [***] after the effective date of such termination, return or cause to be returned to Codexis the Platform Technology to the extent in tangible form, (ii) [***], and (iii) the rights and licenses granted to Codexis in Sections [***] shall survive. In the event of termination by Codexis pursuant to Section 12.2 for breach by Merck or its Affiliates of its obligations under Section 9.4.3, the licenses granted to Merck pursuant to Section [***] and Section [***] shall immediately terminate, and Merck shall, within [***] after the effective date of such termination, return or cause to be returned to Codexis the Platform Technology to the extent in tangible form.

(b) Upon any permitted termination of this Agreement by Merck pursuant to Section 12.2, [***] all rights and licenses granted to Codexis hereunder shall immediately terminate, and Codexis shall, within [***] after the effective date of such termination return or cause to be returned to Merck all Technology and Information of Merck in tangible form, and all substances or compositions delivered or provided by Merck, as well as any other material provided by Merck in any medium.

(c) Upon any permitted termination of this Agreement by Merck pursuant to Section 12.3 (i) the licenses granted to Merck pursuant to Sections [***] shall survive and all payment and reporting obligations hereunder (including, without limitation, those set forth in Article 7) and records retention and audit rights set forth in Article 8 shall survive; and (ii) all rights and licenses granted to Codexis hereunder shall survive.

12.6.3 Codexis Audit Right on Merck Breach; Termination; Divestment. In the event of termination of this Agreement by Codexis pursuant to Section 12.2, 12.3 or 12.5, or by Merck pursuant to Section 12.4, or if Merck sells, leases, loans, provides or otherwise divests to any Third Party any facility or business unit that practices or otherwise uses any Codexis Core Technology, Codexis Core Technology Improvements or other Technology related to Covered

Enzymes or Enzymes, Merck shall provide to Codexis, within ninety (90) days after the effective date of such termination, or within ninety (90) days after the effective date of such divestment, as applicable, a certification signed by a duly authorized executive or non-executive officer of Merck, certifying that all Codexis proprietary materials, information, and technology in custody or control of Merck or sublicensee of Merck, or at the divested facility or business unit, has been destroyed (including, without limitation, all Codexis Software). In addition, Codexis shall have a right to conduct an audit to determine that all Codexis materials, information, and/or technology have been destroyed and that such destruction is complete (the "**Termination and Divestment Audit Right**"). Under the Termination and Divestment Audit Right, Merck shall allow a designee chosen by Codexis and reasonably acceptable to Merck to review documentation, materials, and facilities of Merck as reasonably necessary for such designee to determine whether all Codexis materials, information, and/or technology have been destroyed. Results of such investigation shall be made available to both Merck and Codexis; *provided* that such designee shall disclose to Codexis only its determination of whether all Codexis materials, information, and/or technology has been destroyed. Merck may require such designee to enter into an appropriate written agreement obligating it to be bound by obligations of confidentiality and restrictions on use of such Information that are comparable to the obligations set forth in Article 10. The Termination and Divestment Audit Right shall continue until the earlier of (a) ten (10) years after the effective date of termination of this Agreement by Codexis pursuant to Section 12.2, 12.3 or 12.5, or by Merck pursuant to Section 12.4 or (b) until a designee determines, pursuant to the Codexis' exercise of the Termination and Divestment Audit Right, that all Codexis materials, information, and/or technology has been destroyed. All reasonable expenses arising from the first audit shall be at Codexis' expense, and all subsequent audits, if any, shall be at Merck's expense.

12.7 Survival. Notwithstanding anything to the contrary in this Agreement:

12.7.1 the following provisions shall survive, as well as any other provision which by its terms or by the context thereof is intended to survive, termination of this Agreement: Article 1 (Definitions), Article 6 (Intellectual Property), Article 10 (Confidentiality) (for the time period set forth in Section 10.1), Article 14 (Miscellaneous), and Sections 3.3, 3.4.1, 3.4.2, 3.4.3, 3.4.5, 3.6.2, 9.6, 11.1, 11.2, 11.3, 12.6 and 12.7;

12.7.2 Article 8 (Records Retention and Audit Rights) and Sections 3.1, 3.2, 3.5.6, 7.4, 7.5, 7.6, 7.8, 7.9, 7.10 and 7.11 shall survive termination in accordance with Section 12.6.2;

12.7.3 Section 3.6 shall survive termination solely to the extent that Sections 3.2 and/or 3.5.6 survive termination in accordance with Section 12.6.2; and

12.7.4 Section 7.7 shall survive termination if the Agreement is terminated by Codexis pursuant to Sections 12.2, 12.3 or 12.5 or by Merck pursuant to Section 12.4.

Except as otherwise expressly provided, all other rights, licenses and obligations shall terminate upon termination of this Agreement.

13. DISPUTE RESOLUTION.

13.1 Resolution by Executive Officers. The Parties agree that the procedures set forth in this Article 13 shall be the exclusive mechanism for resolving any dispute, controversy, or claim, which are not Excluded Claims, (each, a "**Dispute**") between the Parties that may arise from time to time pursuant to this Agreement relating to any Party's rights and/or obligations. Except as otherwise provided in this Agreement, in the event of any Dispute between the Parties in connection with this Agreement, the construction hereof, or the rights, duties or liabilities of either Party hereunder, the Parties shall first attempt in good faith to resolve such Dispute by negotiation and consultation between themselves. In the event that such Dispute is not resolved on an informal basis within ten (10) Business Days, either Party may, by written notice to the other Party, refer the Dispute to the executive officers designated by the Parties for attempted resolution. Such officers, or their designees, shall attempt in good faith to promptly resolve such Dispute within thirty (30) Business Days thereafter. In the event that any matter is not resolved under the foregoing provisions, each Party may, at its sole discretion, seek resolution of such matter in accordance with Section 13.2.

13.2 Arbitration. Subject to Section 13.3, any Dispute referred for arbitration shall be finally resolved by binding arbitration before a panel of three (3) arbitrators in accordance with the rules of the American Arbitration Association (**"AAA"**) in effect at the time the proceeding is initiated. If the issues in Dispute involve scientific, technical or commercial matters, then any arbitrator chosen under this Agreement shall have educational training and industry experience sufficient to demonstrate a reasonable level of relevant scientific, technical and commercial knowledge relevant to the subject matter of the Dispute. All proceedings and communications as part of the arbitration shall be in English. Following selection of the third arbitrator, the arbitrators shall use all reasonable efforts to complete the arbitration proceedings and render an award within six (6) months after the last arbitrator is appointed. In any such arbitration, the following additional procedures shall apply:

13.2.1 Rules. The arbitration shall be conducted pursuant to the then-current AAA rules in effect for disputes between U.S. parties on the date of commencement of the arbitration; *provided, however*, that discovery in any arbitration shall be conducted in accordance with

the AAA Commercial Arbitration Rules in effect immediately prior to October 1, 2013, for large complex commercial disputes between U.S. based entities.

13.2.2 Panel. Within thirty (30) days after a Party demands arbitration, each Party shall select one (1) arbitrator and the third chosen by the two (2) Party-chosen arbitrators. If either, or both, of Merck or Codexis fails to choose an arbitrator within thirty (30) days after receiving notice of commencement of arbitration or if the two arbitrators fail to choose a third arbitrator within thirty (30) days after their appointment , then either or both Parties shall immediately request that the AAA select the remaining number of arbitrators to be selected, which arbitrator(s) shall have an appropriate background, experience and expertise in the subject matter at issue in the Dispute. The place of arbitration shall be [***], United States of America. The seat of arbitration shall be the State of New York, United States of America (for clarity, the Parties intend this to mean that the procedural rules of the State of New York, United States of America, will apply to any arbitration).

13.2.3 Injunctive Relief; Costs and Expenses. Either Party may apply to the arbitrators for interim injunctive relief until the arbitration decision is rendered or the Dispute is otherwise resolved. Either Party may, without waiving any right or remedy under this Agreement, seek from any court having jurisdiction any injunctive or provisional relief necessary to protect the rights or property of that Party pending resolution of the Dispute pursuant to this Article 13. The arbitrators shall have no authority to award punitive or any other type of damages not measured by a Party's compensatory damages. Each Party will share equally the cost and expenses of the panel selected in Section 13.2.2 and any administrative fees unless in each case the arbitrators agree otherwise, which they are hereby empowered, authorized and instructed to do if they determine that to be fair and appropriate. Each Party shall bear its own costs and expenses and attorneys' fees in connection with any such arbitration; *provided, however,* that the prevailing Party in any such arbitration shall be entitled to recover from the other Party the reasonable attorneys' fees, costs and expenses incurred by such prevailing Party in connection with such arbitration.

13.2.4 Confidentiality. Except to the extent necessary to confirm an award or decision or as may be required by Applicable Law, or the requirement of any exchange on which a Party's shares are traded, neither Party nor any arbitrator may disclose the existence or results of any arbitration without the prior written consent of both Parties. In no event shall any arbitration be initiated after the date when commencement of a legal or equitable proceeding based on the Dispute would be barred by the applicable New York statute of limitations.

13.2.5 Breach of the Agreement. In the event of a Dispute involving the alleged breach of this Agreement (including, without limitation, whether a Party has satisfied its diligence obligations hereunder), (a) neither Party may terminate this Agreement under Section 12.2

until resolution of the Dispute pursuant to this Article 13 and (b) if the arbitrators render a decision that a breach of this Agreement has occurred, the arbitrators shall have no authority to modify the right of the non-breaching Party to terminate this Agreement in accordance with Section 12.2**.**

13.2.6 Performance. Any disputed performance or suspended performance pending the resolution of a Dispute that the arbitrators determine to be required to be performed by a Party shall be completed within a reasonable time period following the final decision of the arbitrators.

13.2.7 Binding Decision. The decision of the arbitrators shall be the sole, exclusive and binding remedy between the Parties regarding the determination of all Disputes presented. The arbitrators shall prepare and deliver to the Parties a written, reasoned opinion conferring their decision. Judgment on the award so rendered may be entered in any court having competent jurisdiction thereof. Any monetary payment to be made by a Party pursuant to a decision of the arbitrators shall be made in Dollars, free of any tax or other deduction.

13.3 [***]. Notwithstanding anything in this Agreement to the contrary, any and all issues regarding (a) [***], (b) [***], or (c) any other [***], shall be [***]. This Section 13.3 shall not be construed to [***].

14. MISCELLANEOUS.

14.1 Regulatory Responsibilities and Costs. As between the Parties, Merck shall prepare, file, maintain and own all Regulatory Filings and related submissions with respect to all Therapeutic Products and shall bear the cost of such preparation, filing, maintenance and ownership. As between the Parties, Merck shall be solely responsible for communicating with the FDA and/or any other Regulatory Authority in any country or jurisdiction regarding all Therapeutic Products.

14.2 Commercialization Responsibilities and Costs. As between the Parties, Merck shall be solely responsible for all commercialization activities relating to Therapeutic Products, at Merck's sole cost and expense, and shall have sole decision-making authority with respect to the foregoing. Merck shall conduct all commercialization activities under this Agreement in compliance with all Applicable Law. For clarity, nothing in this Agreement shall require Merck to develop or commercialize any minimum number of Therapeutic Products or limit the number of Therapeutic Products that Merck may develop or commercialize.

14.3 Party Employees. Notwithstanding anything to the contrary under this Agreement, under no circumstance would any employee, contractor, contingent worker or consultant of a Party be considered an employee, contractor, contingent worker or consultant of the other Party.

The Party who sends any employee, contractor, contingent worker or consultant to work at the other Party's premises shall assume all liability for such employees, contractors, contingent workers or consultants working at the other Party's premises and shall procure that its employees, contractors, contingent workers or consultants comply with all security, health and safety and other policies applicable to occupiers of the hosting Party's premises.

14.4 Non-Solicitation. During the period beginning on the Effective Date and ending on the date that is [***] (the "**Non-Solicitation Period**"), neither Party shall directly or indirectly, solicit, hire, employ or attempt to solicit, hire or employ any person acting in a scientific role who is or was an employee or contractor of the other Party or such other Party's Affiliates during the Non-Solicitation Period, or in any other way directly or indirectly seek to solicit, induce, bring about, influence, promote, facilitate, or encourage any such individual to work for such Party; *provided* that the foregoing shall not restrict a Party or its Affiliates from advertising employment opportunities in any manner that does not directly target the other Party or its Affiliates or from hiring or employing any person who responds to such generalized public advertisements.

14.5 Severability. If any one or more of the provisions contained in this Agreement is held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby, unless the absence of the invalidated provision(s) adversely affects the substantive rights of the Parties. The Parties shall in such an instance use reasonable efforts to replace the invalid, illegal or unenforceable provision(s) with valid, legal and enforceable provision (s) which, insofar as practical, implement the purposes of this Agreement.

14.6 Notices. All notices which are required or permitted hereunder shall be in writing and sufficient if delivered personally, sent by facsimile (and promptly confirmed by personal delivery, registered or certified mail or overnight courier), sent by nationally-recognized overnight courier or sent by registered or certified mail, postage prepaid, return receipt requested, addressed as follows:

if to Codexis, to:	Codexis, Inc. 200 Penobscot Drive Redwood City, CA 94063 Attention: [***] Fax: [***] Email: [***]
and:	Codexis, Inc. 200 Penobscot Drive Redwood City, CA 94063 Attention: [***] Telephone: [***] Fax: [***] Email: [***]
if to Merck, to:	Merck Sharp & Dohme Corp. One Merck Drive P.O. Box 100, WS3A-65 Whitehouse Station, NJ 08889-0100 Attention: [***] Facsimile No.: [***]
and	Merck Sharp & Dohme Corp. 2000 Galloping Hill Road Kenilworth, NJ 07033 Attention: [***] Facsimile: [***]

or to such other address(es) as the Party to whom notice is to be given may have furnished to the other Party in writing in accordance herewith. Any such notice shall be deemed to have been given: (a) when delivered if personally delivered or sent by facsimile on a business day (or if delivered or sent on a non-business day, then on the next business day); (b) on the business day after dispatch if sent by nationally-recognized overnight courier; or (c) on the fifth (5th) business day following the date of mailing, if sent by mail.

14.7 Force Majeure. Except for the payment of money, neither Party shall be held liable to the other Party nor be deemed to have defaulted under or breached this Agreement for failure or delay in performing any obligation under this Agreement to the extent such failure or delay is caused by or results from causes beyond the reasonable control of the affected Party, potentially

including, but not limited to, embargoes, war, acts of war (whether war be declared or not), acts of terrorism, insurrections, riots, civil commotions, strikes, lockouts or other labor disturbances, fire, floods, or other acts of God, or acts, omissions or delays in acting by any governmental authority or the other Party. The affected Party shall notify the other Party of such force majeure circumstances as soon as reasonably practical, and shall promptly undertake Commercially Reasonable Efforts to cure such force majeure circumstances.

14.8 Assignment. Except as provided in this Section 14.8, this Agreement may not be assigned or otherwise transferred, nor may any right or obligation hereunder be assigned or transferred, by either Party without the consent of the other Party; *provided, however*, that either Party may, without such consent, assign this Agreement and its rights and obligations hereunder, in whole or in part, to an Affiliate or in connection with the transfer or sale of all or substantially all of its assets related to the subject matter of this Agreement, or in the event of its merger or consolidation or change in control or similar transaction. This Agreement shall inure to the benefit of and be binding on the Parties' successors and assigns. Any attempted assignment not in accordance with this Section 14.8 shall be void. Any permitted assignee shall assume all assigned obligations of its assignor under this Agreement.

14.9 Waivers and Modifications. The waiver by either Party hereto of any right hereunder, or of any failure of the other Party to perform, or of any breach by the other Party, shall not be deemed a waiver of any other right hereunder or of any other breach by or failure of such other Party whether of a similar nature or otherwise. No waiver, modification, release or amendment of any obligation under or provision of this Agreement shall be valid or effective unless in writing and signed by both Parties.

14.10 Applicable Law. This Agreement shall be governed by and construed in accordance with the laws of the State of New York and the patent laws of the United States without reference to any rules of conflict of laws or renvoi, and excludes (a) the United Nations Convention on Contracts for the International Sales of Goods; (b) the 1974 Convention on the Limitation Period in the International Sale of Goods (the "**1974 Convention**"); (c) the Protocol amending the 1974 Convention, done at Vienna April 11, 1980; and (d) the Uniform Computer Information Transactions Act; *provided, however*, that with respect to matters involving the enforcement, validity or scope of Intellectual Property Rights, the laws of the applicable country shall apply.

14.11 Independent Contractors. It is expressly agreed that Codexis and Merck shall be independent contractors and that the relationship between the two Parties shall not constitute a partnership, joint venture or agency. Neither Codexis nor Merck shall have the authority to make

any statements, representations or commitments of any kind, or to take any action, which shall be binding on the other Party, without the prior written consent of the other Party.

14.12 Entire Agreement. This Agreement, together with the Exhibits hereto, contains the entire understanding of the Parties with respect to the subject matter hereof. Any other express or implied agreements and understandings, negotiations, writings and commitments, either oral or written, in respect to the subject matter hereof are superseded by the terms of this Agreement. The Exhibits to this Agreement are incorporated herein by reference and shall be deemed a part of this Agreement. This Agreement may be amended, or any term hereof modified, only by a written instrument duly executed by authorized representative(s) of both Parties hereto. Notwithstanding anything to the contrary in the foregoing, and subject to Section 10.6 hereof, the Confidential Disclosure Agreement shall remain in full force and effect with respect to the subject matter thereof and information disclosed thereunder.

14.13 Counterparts. This Agreement may be signed in any number of counterparts (facsimile and electronic transmission included), each of which shall be deemed an original, but all of which shall constitute one and the same instrument. After facsimile or electronic transmission, the parties agree to execute and exchange documents with original signatures.

14.14 Waiver of Rule of Construction. Each Party has had the opportunity to consult with counsel in connection with the review, drafting and negotiation of this Agreement. Accordingly, the rule of construction that any ambiguity in this Agreement shall be construed against the drafting Party shall not apply.

14.15 Certain Conventions. Any reference in this Agreement to an Article, Section, subsection, paragraph, clause, Exhibit shall be deemed to be a reference to an Article, Section, subsection, paragraph, clause, or Exhibit, of or to, as the case may be, this Agreement, unless otherwise indicated. Unless the context of this Agreement otherwise requires, (a) words of any gender include each other gender, (b) words such as “herein”, “hereof”, and “hereunder” refer to this Agreement as a whole and not merely to the particular provision in which such words appear, (c) words using the singular shall include the plural, and vice versa.

14.16 Headings. The captions to the several Articles, Sections and subsections hereof are not a part of this Agreement, but are merely for convenience to assist in locating and reading the several Articles and Sections hereof.

14.17 Cumulative Remedies. No remedy referred to in this Agreement is intended to be exclusive, but each shall be cumulative and in addition to any other remedy referred to in this Agreement or otherwise available under law.

14.18 References. Unless the context requires otherwise, (a) any definition of or reference to any agreement, instrument or other document herein shall be construed as referring to such agreement, instrument or other document as from time to time amended, supplemented or otherwise modified (subject to any restrictions on such amendments, supplements or modifications set forth herein or therein), (b) any reference to Applicable Law herein shall be construed as referring to such Applicable Law as from time to time enacted, repealed or amended, and (c) any reference herein to any Person shall be construed to include the Person's successors and assigns.

14.19 Ethical Business Practices.

14.19.1 Codexis acknowledges that Merck's corporate policy requires that Merck's business must be conducted within the letter and spirit of the law. By signing this Agreement, Codexis agrees to conduct the services contemplated herein in a manner which is consistent with both law and good business ethics.

14.19.2 Codexis warrants that [***]. Codexis shall not make any payment, either directly or indirectly, of money or other assets, including but not limited to the compensation Codexis derives from this Agreement (hereinafter collectively referred as a **"Payment"**), to government or political party officials, officials of international public organizations, candidates for public office, or representatives of other businesses or persons acting on behalf of any of the foregoing (hereinafter collectively referred as **"Officials"**) where such Payment would constitute violation of any law. In addition regardless of legality, Codexis shall make no Payment either directly or indirectly to Officials if such Payment is for the purpose of influencing decisions or actions with respect to the subject matter of this Agreement.

14.19.3 Codexis acknowledges that no employee of Merck or its Affiliates shall have authority to give any direction, either written or oral, relating to the making of any commitment by Codexis or its agents to any Third Party in violation of terms of this or any other provisions of this Agreement.

14.19.4 Codexis certifies to Merck that as of the date of this Agreement [***]. After the execution of this Agreement, Codexis shall [***].

14.19.5 [***]

[Signature Page Follows]

IN WITNESS WHEREOF, the Parties have caused this Platform Technology Transfer and License Agreement to be executed by their respective duly authorized officers as of the Effective Date.

Codexis, Inc.
By: /s/ John Nicols
Name: John Nicols

Title: President and CEO

Merck Sharp & Dohme Corp.
By: /s/ Iain Dukes

Name: Iain Dukes, D. Phil

Title: Senior Vice President

Exhibit 1.19

Codexis Core Patents

Attached.

EXHIBIT 1.19

CODEXIS CORE PATENTS							
Country	**Application Title**	**Application Status**	**Application Number**	**Filing Date**	**Publication Number**	**Patent Number**	**Issue Date**
US	COMBINED AUTOMATED PARALLEL SYNTHESIS OF POLYNUCLEOTIDE VARIANTS	Granted	12/562,988	09/18/2009	US-2010-0093560A1	8383346	02/26/2013
CN	METHOD OF SYNTHESIZING POLYNUCLEOTIDE VARIANTS	Granted	200980122093.2	12/13/2010	102066561	200980122093.2	09/25/2013
CA	METHOD OF SYNTHESIZING POLYNUCLEOTIDE VARIANTS	Granted	2,726,850	12/02/2010	2726850	2726850	06/02/2015
EP	METHOD OF SYNTHESIZING POLYNUCLEOTIDE VARIANTS	Allowed	9763625.2	11/29/2010	2285958		
IN	METHOD OF SYNTHESIZING POLYNUCLEOTIDE VARIANTS	Published	8090/CHEN/2010	12/13/2010	8090/CHENP/2010A		
SG	METHOD OF SYNTHESIZING POLYNUCLEOTIDE VARIANTS	Granted	201009215-3	12/13/2010		167342	05/31/2013
CA	COMBINED AUTOMATED PARALLEL SYNTHESIS OF POLYNUCLEOTIDE VARIANTS	Allowed	2763017	11/21/2011	2763017		
CN	COMBINED AUTOMATED PARALLEL SYNTHESIS OF POLYNUCLEOTIDE VARIANTS	Granted	200980159766.1	12/08/2011	102803489	ZL200980159766.1	01/28/2015
EP	COMBINED AUTOMATED PARALLEL SYNTHESIS OF POLYNUCLEOTIDE VARIANTS	Published	9845944.9	12/05/2011	2451951		
IN	COMBINED AUTOMATED PARALLEL SYNTHESIS OF POLYNUCLEOTIDE VARIANTS	Published	9101/CHENP/2011	12/07/2011	9101/CHENP/2011 A		
US	COMBINED AUTOMATED PARALLEL SYNTHESIS OF POLYNUCLEOTIDE VARIANTS	Published	14/505209	10/02/2014	20150024971		

CODEXIS CONFIDENTIAL INFORMATION

US	METHOD OF SELECTING AN OPTIMIZED, DIVERSE POPULATION OF VARIANTS	Granted	12/867429	08/12/2010	US20110029468	8504498	08/06/2013
EP	METHOD OF SELECTING AN OPTIMIZED, DIVERSE POPULATION OF VARIANTS	Published	9710859.1	02/12/2009	2250595		
EP	METHOD OF GENERATING AN OPTIMIZED, DIVERSE POPULATION OF VARIANTS	Published	9710490.5	02/12/2009	2250594		
US	METHOD OF GENERATING AN OPTIMIZED, DIVERSE POPULATION OF VARIANTS	Granted	12/867433	10/21/2010	2011-0034342	8768871	07/01/2014
US	METHOD OF GENERATING AN OPTIMIZED, DIVERSE POPULATION OF VARIANTS	Published	14/281421	05/19/2014	2014/0256557		
EP	REDUCED CODON MUTAGENESIS	Published	10817881.5	03/30/2012	2478137		
US	PROTEIN VARIANT GENERATION BY REGION SHUFFLING	Published	13/577,651	08/07/2012	2014/0005057		
EP	PROTEIN VARIANT GENERATION BY REGION SHUFFLING	Published	12803889.0	12/12/2013	2726651		
US	GENE SHUFFLING METHODS	Published	14/385060	09/12/2014	20150050658		
EP	GENE SHUFFLING METHODS	Published	13760490.6	10/14/2014	2825647		
US	METHODS, SYSTEMS, AND SOFTWARE FOR IDENTIFYING BIO-MOLECULES WITH INTERACTING COMPONENTS	Published	14/167709	01/29/2014	20140214391		
WO	METHODS, SYSTEMS, AND SOFTWARE FOR IDENTIFYING BIO-MOLECULES WITH INTERACTING COMPONENTS	Published	PCT/US2014/013666	01/29/2014	WO2014120819		
US	STRUCTURE BASED PREDICTIVE MODELING	Published	14/498881	09/26/2014	20150134315		

WO	STRUCTURE BASED PREDICTIVE MODELING	Published	PCT/US2014/057900	09/26/2014	WO2015048573		
US	AUTOMATED SCREENING OF ENZYME VARIANTS	Published	14/498864	09/26/2014	20150133307		
WO	AUTOMATED SCREENING OF ENZYME VARIANTS	Published	PCT/US2014/057899	09/26/2014	WO2015048572		
US	METHODS, SYSTEMS, AND SOFTWARE FOR IDENTIFYING BIO-MOLECULES USING MODELS OF MULTIPLICATIVE FORM	Published	14/167713	01/29/2014	20140221216		
WO	METHODS, SYSTEMS, AND SOFTWARE FOR IDENTIFYING BIO-MOLECULES USING MODELS OF MULTIPLICATIVE FORM	Published	PCT/US2014/013668	01/29/2014	WO2014120821		

Exhibit 1.20

Codexis Core Technology

The enzyme optimization process starts by identifying genes that code for enzymes known to have the general type of catalytic reactivity for a desired chemical reaction. Typically, we identify gene sequences in published databases and then synthesize candidate genes having those sequences. Using a variety of biotechnology tools, we diversify these genes by introducing mutations, giving rise to changes in the enzymes for which they encode. The methods for diversifying these genes, and types of diversity being tested, often vary over the course of an enzyme optimization program. For finding initial diversity, methods typically include random mutagenesis and site-directed (included structure-guided) mutagenesis. We also test mutational variations that distinguish related enzymes among different organisms. Once we have identified potentially beneficial mutations, we test combinations of these mutations in libraries made using our proprietary gene recombination methodologies, gene shuffling and multiplexed gene SOEing, or Splicing by Overlap Extension.

With our proprietary gene shuffling methodology, we generate libraries of genes that have random combinations of the mutations we are testing. The pool of genes is used to transform host cells, which entails introducing the various genes, one by one, into host cells. These cells are then segregated and grown into colonies. Cells from individual colonies are cultured in high throughput to produce the enzyme encoded by the shuffled gene in those cells. The enzymes are then screened in high throughput using test conditions relevant to the desired process. The screening results identify individual shuffled genes that produce improved enzymes having combinations of beneficial mutations and weed out enzymes having detrimental ones. Using different test conditions and/or different analytical methods, we can identify variant enzymes that exhibit various improved performance characteristics, such as stability, activity and selectivity, under conditions relevant to the desired chemical process.

In the next step in our optimization process, we use our proprietary software tool, ProSAR™, to analyze protein sequence-activity relationships. ProSAR™ aids in identifying specific gene and enzyme mutations that are beneficial, neutral or detrimental with respect to the desired performance characteristics. Earlier directed evolution methods did not separately evaluate individual mutations in libraries of variants which carry multiple mutations, where beneficial and detrimental performance characteristics may be mixed in an individual gene or enzyme. Capitalizing on the advent of inexpensive gene sequencing, we are able to determine which particular mutations are present in the genes and proteins we have screened. Our ProSAR™ bioinformatics software relates the screening results to the mutations and ranks the individual mutations with regard to their degree of benefit or detriment, relative to whichever process parameter(s) the screening tested. Using that information, we can bias the pool of mutational diversity in the next iteration to further the accumulation of beneficial diversity and cancel out detrimental diversity in the individual genes in the resulting shuffled library. The ProSAR™ results also help us develop ideas about new diversity to test. ProSAR™, combined with efficient gene synthesis and high quality library generation methods, has led to a significant increase in the efficiency and speed of enzyme improvement and optimization.

In another step of our optimization process, we take the best variants we have identified and prepare enough of each to test in the desired chemical process at laboratory scale, for in-process confirmation. This optimization routine is done iteratively, typically adding new diversity to the pool in each iteration. The gene that codes for the best performing enzyme in one iteration is used as the starting gene for the next iteration of shuffling and screening. As the enzymes improve over these iterations, the screening conditions are made increasingly more stringent. In this way, enzymes are rapidly optimized until all in-process performance requirements have been achieved and the economic objectives for the desired process have been met.

Multiplexed gene SOEing is our proprietary methodology for rapidly generating gene variants. Using multiplexed gene SOEing, we rapidly generate collections of individual gene variants that have predetermined, as opposed to random, combinations of mutations we are testing. It is based on a biotechnology technique, which we refer to as SOEing, generally used to make a hybrid, or spliced, gene from fragments of two genes and/or to introduce a specific mutation into a splice between fragments of one gene. We have automated the process to make robotically, in parallel, one hundred to several hundred variants, each with a predetermined combination of the mutations we are testing. The variants are introduced into host cells, and the encoded enzyme is produced and screened in high throughput, as described above.

Using multiplexed gene SOEing, we can test many mutations and combinations thereof in parallel, and because the mutation incorporation is controlled and predetermined before screening, as opposed to random incorporation and selection after screening, the resulting data set can be more optimal for ProSAR™ analysis.

We believe using multiplexed gene SOEing to survey many mutations quickly, followed by ProSAR™-driven shuffling of beneficial mutations, is a particularly effective approach, providing rapid gains in enzyme performance.

Exhibit 1.25

Codexis Enzyme Patents

Attached.

EXHIBIT 1.25

CODEXIS ENZYME PATENTS							
Country	**Application Title**	**Application Status**	**Application Number**	**Filing Date**	**Publication Number**	**Patent Number**	**Issue Date**
US	TRANSAMINASE POLYPEPTIDES	Granted	12/684,864	01/08/2010	20100209981A1	8470564	06/25/2013
EP	TRANSAMINASE POLYPEPTIDES	Published	10729606.3	01/08/2010	2385983		
SG	TRANSAMINASE POLYPEPTIDES	Granted	201104947-5	07/06/2011	172891	172891	11/26/2014
IN	TRANSAMINASE POLYPEPTIDES	Published	5648/CHENP/2011	08/04/2011	5648/CHENP/2011		
IL	TRANSAMINASE POLYPEPTIDES	Pending	213950	07/06/2011			
CN	TRANSAMINASE POLYPEPTIDES	Granted	201080010926.9	01/08/2010	102341494	ZL201080010926.9	10/15/2014
US	TRANSAMINASE POLYPEPTIDES	Granted	13/920,902	06/18/2013	2013/0266994A1	9029106	05/12/2015
US	TRANSAMINASE POLYPEPTIDES	Pending	14/684916	04/13/2015			
US	TRANSAMINASE BIOCATALYSTS	Granted	12/714,397	02/26/2010	20100285541A1	8293507	10/23/2012
CN	TRANSAMINASE BIOCATALYSTS	Granted	201080017312.3	10/19/2011	102405281	102405281	05/13/2015
EP	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
IN	TRANSAMINASE BIOCATALYSTS	Published	6857/CHENP/2011	09/22/2011	6857/CHENP/2011		
SG	TRANSAMINASE BIOCATALYSTS	Granted	201106064-7	02/26/2010	173815	173815	11/15/2013
JP	TRANSAMINASE BIOCATALYSTS	Granted	2011-552209	08/23/2011	2012-519004	5707344	03/06/2015
US	TRANSAMINASE BIOCATALYSTS	Granted	13/604,323	09/05/2012	20120329108A1	8889380	11/18/2014
DE	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	202010012539.4	12/18/2013
FR	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
ES	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
CH	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
GB	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
IE	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
IT	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013

NL	TRANSAMINASE BIOCATALYSTS	Granted	10746948.8	09/26/2011	2401366	2401366	12/18/2013
JP	TRANSAMINASE BIOCATALYSTS	Pending	2014-186102	09/12/2014			
US	TRANSAMINASE BIOCATALYSTS	Allowed	14/518143	10/20/2014	20150037869		
CN	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Granted	201080027481.5	12/20/2011	102482648	ZL201080027481.5	12/10/2014
EP	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Published	10797576.5	12/22/2011	2446025		
IN	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Pending	9363/CHENP/2011	12/21/2011			
SG	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Granted	201109538-7	12/21/2011	177331	177331	08/11/2014
US	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Granted	13/378,618	12/15/2011	20120190086A1	8796002	08/05/2014
US	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Granted	14/313465	06/24/2014	20140308732	9029112	05/12/2015
US	KETOREDUCTASE-MEDIATED STEREOSELECTIVE ROUTE TO ALPHA CHLOROALCOHOLS	Pending	14/697262	04/27/2015			
EP	KETOREDUCTASE POLYPEPTIDES FOR THE PREPARATION OF PHENYLEPHRINE	Published	10810597.4	03/15/2012	2467473		
IN	KETOREDUCTASE POLYPEPTIDES FOR THE PREPARATION OF PHENYLEPHRINE	Published		03/15/2012	2372/CHENP/2012 A		
US	KETOREDUCTASE POLYPEPTIDES FOR THE PREPARATION OF PHENYLEPHRINE	Allowed	13/390,677	02/15/2012	20120149073		
SG	KETOREDUCTASE POLYPEPTIDES FOR THE PREPARATION OF PHENYLEPHRINE	Published	201201086-4	02/16/2012	178456		

SG	KETOREDUCTASE POLYPEPTIDES FOR THE PREPARATION OF PHENYLEPHRINE	Published	10201405022P	08/19/2014	10201405022P		
US	KETOREDUCTASE POLYPEPTIDES FOR THE PREPARATION OF PHENYLEPHRINE	Pending	14/755056	06/30/2015			
CN	TRANSAMINASE REACTIONS	Allowed	201080027740.4	12/21/2011	102597226		
EP	TRANSAMINASE REACTIONS	Published	10797544.3	12/22/2011	2446026		
IN	TRANSAMINASE REACTIONS	Published	9683/CHENP/2011	12/22/2011	9683/CHENP/2011		
SG	TRANSAMINASE REACTIONS	Published	201109536-1	12/21/2011	177329		
US	TRANSAMINASE REACTIONS	Granted	13/378,963	04/09/2012	20120190085A1	8921079	12/30/2014
IL	TRANSAMINASE REACTIONS	Pending	216099	11/02/2011			
US	TRANSAMINASE REACTIONS	Published	14/547339	11/19/2014	20150079640		
US	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	12/490,190	06/23/2009	20100063300A1	8178333	05/15/2012
CN	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	200980133157.9	06/23/2009	102131813	ZL200980133157.9	07/30/2014
SG	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	201009300-3	06/23/2009		167392	08/15/2013
EP	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
IN	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Published	397/CHENP/2011	01/19/2011	397/CHENP/2011 A		

US	STEREOMERICALLY PURE FUSED BICYLIC PROLINE COMPOUNDS USEFUL FOR PREPARING HEPATITIS C PROTEASE INHIBITORS	Granted	13/294,930	11/11/2011	20120130087	8859784	10/14/2014
US	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	13/436,506	03/30/2012	20120244581	8574876	11/05/2013
FR	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
DE	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	602009019988.9	11/06/2013
IE	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
IT	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
NL	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
ES	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
CH	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013

GB	BIOCATALYTIC PROCESSES FOR THE PREPARATION OF SUBSTANTIALLY STEREOMERICALLY PURE FUSED BICYCLIC PROLINE COMPOUNDS	Granted	9798485.0	06/23/2009	2307419	2307419	11/06/2013
US	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	12/545,761	08/21/2009	20100055751A1	8288131	10/16/2012
US	POLYNUCLEOTIEDES ENCODING ENGINEERED KETOREDUCTASE POLYPEPTIDES	Granted	13/610,723	09/11/2012	20130005018A1	8455230	06/04/2013
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF A 3-ARYL-3-HYDROXYPROPANAMINE FROM A 3-ARYL-3-KETOPROPANAMINE	Granted	12/549,154	08/27/2009	US2010-0151534-A1	8426178	04/23/2013
EP	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF A 3-ARYL-3-HYDROXYPROPANAMINE FROM A 3-ARYL-3-KETOPROPANAMINE	Allowed	9810573.7	08/27/2009	2329013		
IN	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF A 3-ARYL-3-HYDROXYPROPANAMINE FROM A 3-ARYL-3-KETOPROPANAMINE	Published	2014/CHENP/2011	03/22/2011	2014/CHENP/2011 A		
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF A 3-ARYL-3-HYDROXYPROPANAMINE FROM A 3-ARYL-3-KETOPROPANAMINE	Granted	13/796985	03/12/2013	US-2013-0177962-A1	8673607	03/18/2014
US	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOLYL]-4PHENYL1,3-OXAZOLIDIN-2-ONE	Granted	12/545,034	08/20/2009	20100062499A1	8273554	09/25/2012

CN	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	200980141486.8	04/19/2011	102186972	ZL200980141486.8	08/20/2014
SG	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	201101090-7	02/16/2011		168980	08/19/2014
EP	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014
IN	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Published	2000/CHENP/2011	03/22/2011	2000/CHENP/2011		
US	POLYNUCLEOTIDES ENCODING RECOMBINANT KETOREDUCTASE POLYPEPTIDES	Granted	13/590,882	08/21/2012	20120322136A1	8415126	04/09/2013
US	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOLYL]-4PHENYL1,3-OXAZOLIDIN-2-ONE	Granted	13/764596	02/11/2013	US-2013-0210098-A1	8956840	02/17/2015
SG	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Published	10201404330V	07/23/2014	10201404330V		

FR	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014
DE	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	602009027373.6	10/22/2014
HU	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014
NL	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014
SI	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014
CH	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014

GB	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (4S)-3-[(5S)-5(4-FLUOROPHENYL)-5-HYDROXYPENTANOYL]-4PHENYL-1,3-OXAZOLIDIN-2-ONE	Granted	9810477.1	03/29/2011	2329014	2329014	10/22/2014
US	KETOREDUCTASE POLYPEPTIDES	Allowed	14/606127	01/27/2015	20150132806		
US	ENONE REDUCTASES	Granted	12/646,907	12/23/2009	20100190218A1	8329438	12/11/2012
EP	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	2382308	03/04/2015
IN	ENONE REDUCTASES	Published	4505/CHENP/2011	12/23/2009	4505/CHENP/2011		
SG	ENONE REDUCTASES	Granted	201104630-7	12/23/2009	172783	172783	09/03/2014
US	ENONE REDUCTASES	Granted	13/658,582	10/23/2012	US/2013-0115663-A1	8883475	11/11/2014
US	ENONE REDUCTASES	Allowed	14/504558	10/02/2014	20150031095		
FR	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	2382308	03/04/2015
DE	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	602009029867.4	03/04/2015
IE	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	2382308	03/04/2015
NL	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	2382308	03/04/2015
CH	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	2382308	03/04/2015
GB	ENONE REDUCTASES	Granted	9835878.1	12/23/2009	2382308	2382308	03/04/2015
US	ENONE REDUCTASES	Pending	14/800306	07/15/2015			
US	RECOMBINANT HALOHYDRIN DEHALOGENASE POLYPEPTIDES	Granted	12/642,586	12/18/2009	US2010-0173372A1	8187856	05/29/2012
IN	RECOMBINANT HALOHYDRIN DEHALOGENASE POLYPEPTIDES	Published	5068/CHENP/2011	12/18/2009	5068/CHENP/2011A		
US	RECOMBINANT HALOHYDRIN DEHALOGENASE POLYPEPTIDES	Granted	13/452,328	04/20/2012	20120220002	8580555	11/12/2013
US	PENICILLIN G ACYLASES	Granted	12/615,139	11/09/2009	US-2010-0143968-A1	8247192	08/21/2012
US	PENICILLIN G ACYLASES	Granted	13/542,835	07/06/2012	20120270282A1	8569013	10/29/2013
US	NITRILASE BIOCATALYSTS	Granted	13/381,155	12/28/2011	20120142063	8614081	12/24/2013

US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF 3-ARYL-3-HYDROXYPROPANAMINE FROM A 3-ARYL-3-KETOPROPANAMINE	Granted	12/549,293	08/27/2009	US2010-0173369A1	8288141	10/16/2012
US	POLYNUCLEOTIDES ENCODING ENGINEERED KETOREDUCTASE POLYPEPTIDES	Granted	13/610,166	09/11/2012	20130005017A1	8877475	11/04/2014
US	POLYNUCLEOTIDES ENCODING ENGINEERED KETOREDUCTASE POLYPEPTIDES	Published	14/503578	10/01/2014	20150031094		
CN	SYNTHESIS OF PRAZOLE COMPOUNDS	Granted	201080054980.3	06/04/2012	102884178	201080054980.3	12/03/2014
EP	SYNTHESIS OF PRAZOLE COMPOUNDS	Published	10836590.9	07/05/2012	2510089		
IN	SYNTHESIS OF PRAZOLE COMPOUNDS	Published	5934/CHENP/2012	07/05/2012	5934/CHENP/2012		
SG	SYNTHESIS OF PRAZOLE COMPOUNDS	Granted	201204152-1	06/06/2012	181535	181535	01/22/2015
US	SYNTHESIS OF PRAZOLE COMPOUNDS	Granted	13/514,750	06/08/2012	20130017580A1	8895271	11/25/2014
US	SYNTHESIS OF PRAZOLE COMPOUNDS	Published	14/528708	10/30/2014	20150056668		
EP	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	11778262.3	12/03/2012	2566497	2566497	07/29/2015
IN	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Published	10077/CHENP/2012	11/30/2012	10077/CHENP/2012		
US	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	13/695,856	11/02/2012	US20130052699	9040262	05/26/2015
US	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Pending	14/692964	04/22/2015			
DE	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	11778262.3	12/03/2012	2566497	2566497	07/29/2015
FR	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	11778262.3	12/03/2012	2566497	2566497	07/29/2015
GB	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	11778262.3	12/03/2012	2566497	2566497	07/29/2015

IE	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	11778262.3	12/03/2012	2566497	2566497	07/29/2015
HU	BIOCATALYSTS FOR EZETIMIBE SYNTHESIS	Granted	11778262.3	12/03/2012	2566497	2566497	07/29/2015
US	PROCESSES USING AMINO ACID DEHYDROGENASES AND KETOREDUCTASE-BASED COFACTOR REGENERATING SYSTEM	Granted	13/577,772	10/16/2012	2013/0029385	9080192	07/14/2015
IN	PROCESSES USING AMINO ACID DEHYDROGENASES AND KETOREDUCTASE-BASED COFACTOR REGENERATING SYSTEM	Published	7740/CHENP/2012	09/07/2012	7740/CHENP/2012		
US	PROCESSES USING AMINO ACID DEHYDROGENASES AND KETOREDUCTASE-BASED COFACTOR REGENERATING SYSTEM	Pending	14/742215	06/17/2015			
SG	STRUCTURE-ACTIVITY RELATIONSHIPS	Published	201200817-3	02/12/2001	178753		
US	STRUCTURE-ACTIVITY RELATIONSHIPS	Published	13/757554	02/01/2013	2013/0165341		
US	STRUCTURE-ACTIVITY RELATIONSHIPS	Published	14/662541	03/19/2015	2015/0191767		
CN	KETOREDUCTASES AND USES THEREOF	Granted	200880004582.3	02/08/2008	CN 101627116A	ZL2008 8 0004582.3	07/10/2013
SG	KETOREDUCTASES AND USES THEREOF	Granted	200904674-9	02/08/2008		154045	03/30/2012
KR	KETOREDUCTASES AND USES THEREOF	Granted	10-2009-7016084	02/08/2008		1502634	03/09/2015
US	KETOREDUCTASES AND USES THEREOF	Granted	12/028,780	02/08/2008	2008/0318295	7820421	10/26/2010
EP	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
IL	KETOREDUCTASES AND USES THEREOF	Pending	199399	02/08/2008			
JP	KETOREDUCTASES AND USES THEREOF	Published	2009-549110	02/08/2008	2010-517574		

US	KETOREDUCTASES AND USES THEREOF	Granted	12/881,734	09/14/2010	2011/0165670A1	8071347	12/06/2011
CH	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
DE	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
FR	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
GB	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
IE	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
NL	KETOREDUCTASES AND USES THEREOF	Granted	8725329.0	02/08/2008	2115130	2115130	08/03/2011
US	KETOREDUCTASES AND USES THEREOF	Granted	13/290,773	11/07/2011	2012/0178142	8415127	04/09/2013
US	KETOREDUCTASES AND USES THEREOF	Granted	13/793158	03/11/2013	2013/0196408	8980605	03/17/2015
JP	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	2007-526267	06/04/2005		5042831	07/20/2012
DE	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	102004029112.8	06/11/2004		1763577	10/06/2010
EP	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	5756002.1	06/04/2005	1763577	1763577	10/06/2010
US	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	11/629,000	12/08/2006	2009/0162893	7,943,356	05/17/2011

GB	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	5756002.1	06/04/2005	1763577	1763577	10/06/2010
IT	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	5756002.1	06/04/2005	1763577	1763577	10/06/2010
AT	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	5756002.1	06/04/2005	1763577	1763577	10/06/2010
FR	ALCOHOL DEHYDROGENASE FOR THE STEREOSELECTIVE PRODUCTION OF HYDROXY COMPOUNDS	Granted	5756002.1	06/04/2005	1763577	1763577	10/06/2010
SG	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	201000745-8	08/24/2008		159008	09/14/2012
IN	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Pending	1624/CHENP/2010	08/24/2008			
EP	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	2195443	01/07/2015
CN	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	200880104011.7	08/24/2008	101784669	ZL200880104011.7	02/18/2015
US	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	12/197,286	08/24/2008	2009/0093031	7977078	07/12/2011

US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	13/110,789	05/18/2011	2011/0217754	8,227,229	07/24/2012
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	13/525,048	06/15/2012	2012/0276599A1	8962285	02/24/2015
DE	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	602008036257.4	01/07/2015
FR	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	2195443	01/07/2015
IE	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	2195443	01/07/2015
NL	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	2195443	01/07/2015
CH	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	2195443	01/07/2015
GB	KETOREDUCTASE POLYPEPTIDES FOR THE STEREOSELECTIVE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Granted	8798570.1	08/24/2008	2195443	2195443	01/07/2015
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF (R)-3-HYDROXYTHIOLANE	Published	14/597996	01/15/2015	2015/0125910		
CN	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	200880115770.3	09/13/2008	101855342	ZL 2008 8 0115770.3	07/10/2013

JP	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Published	2010-525057	09/13/2008	2010-538657		
US	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	12/210,195	09/13/2008	2009/0191605	8748143	06/10/2014
IN	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Pending	2039/CHENP/2010	09/13/2008			
SG	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	201001576-6	09/13/2008		159828	04/13/2012
EP	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	2198018	11/20/2013
KR	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Pending	10-2010-7007675	09/13/2008			
US	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	13/682,600	11/20/2012	2013/0078692	8512973	08/20/2013
US	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	13/970284	08/19/2013	2013/0344552	8852909	10/07/2014
DE	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	602008028883.8	11/20/2013
FR	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	2198018	11/20/2013
CH	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	2198018	11/20/2013
GB	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	2198018	11/20/2013

IE	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	2198018	11/20/2013
NL	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Granted	8830789.7	09/13/2008	2198018	2198018	11/20/2013
US	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Published	14/501416	09/30/2014	2015/0017695		
JP	KETOREDUCTASE POLYPEPTIDES FOR THE REDUCTION OF ACETOPHENONES	Published	2015-21874	02/06/2015	2015-91269		
SG	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	201001902-4	09/28/2008		160022	07/31/2013
US	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	12/240,986	09/29/2008	2009/0155863	8088610	01/03/2012
CN	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	200880118039.6	09/28/2008	101889081	ZL200880118039.6	06/18/2014
EP	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	8833139.2	09/28/2008	2203557	2203557	02/29/2012
IN	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Pending	2378/CHENP/2010	09/28/2008			
IL	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	204331	09/28/2008		204331	07/31/2013
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF (S,3)-METHYL2-(3-(3-(2(7-CHLOROQUINOLIN-2-YL)VINYL)PHENYL)-3-HYDROXYPROPYL)BENZOATE	Granted	13/329,986	12/19/2011	2012/0184000	8617853	12/31/2013
DE	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	8833139.2	09/28/2008	2203557	2203557	02/29/2012
IE	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	8833139.2	09/28/2008	2203557	2203557	02/29/2012
NL	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	8833139.2	09/28/2008	2203557	2203557	02/29/2012

CH	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	8833139.2	09/28/2008	2203557	2203557	02/29/2012
GB	KETOREDUCTASE POLYPEPTIDES AND USES THEREOF	Granted	8833139.2	09/28/2008	2203557	2203557	02/29/2012
EP	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF ARMODAFINIL	Published	11846568.1	07/14/2013	2649187		
[***]	[***]	[***]	[***]	[***]			
[***]	[***]	[***]	[***]	[***]			
US	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF ARMODAFINIL	Published	13/992,138	06/06/2013	2013-0260426A1		
EP	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (S)-3-(1-AMINOETHYL)-PHENOL	Published	11796441.1	12/17/2012	2582799		
IN	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (S)-3-(1-AMINOETHYL)-PHENOL	Published	267/CHENP/2013	01/11/2013	267/CHENP/2013		
US	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (S)-3-(1-AMINOETHYL)-PHENOL	Granted	13/704507	12/14/2012	20130089898A1	8852900	10/07/2014
US	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (S)-3-(1-AMINOETHYL)-PHENOL	Granted	14/463332	08/19/2014	20140356944	8932838	01/13/2015
EP	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Granted	11818555.2	04/29/2013	2606139	2606139	07/15/2015

IN	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Published	2013/CHENP/2013	03/13/2013	2013/CHENP/2013		
US	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Granted	13/817295	03/12/2013	US-2013-0164794-A1	8932836	01/13/2015
DE	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Granted	11818555.2	04/29/2013	2606139	2606139	07/15/2015
FR	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Granted	11818555.2	04/29/2013	2606139	2606139	07/15/2015
GB	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Granted	11818555.2	04/29/2013	2606139	2606139	07/15/2015
IE	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF (1R,2R)-2-(3,4-DIMETHOXYPHENETHOXY)CYCLOHEXANAMINE	Granted	11818555.2	04/29/2013	2606139	2606139	07/15/2015
SG	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	201001989-1	10/01/2008		160517	05/05/2014
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	12/243,968	10/01/2008	US2009/0162909	7883879	02/08/2011
EP	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
IL	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	204379	10/01/2008		204379	10/01/2014
JP	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	2010-527257	10/01/2008		5646328	11/14/2014
IN	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Pending	2450/CHENP/2010	10/01/2008			
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	12/977,825	12/23/2010	20110159567A1	8257952	09/04/2012

US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	13/569,900	08/08/2012	20130034895	8470572	06/25/2013
US	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	13/925096	06/24/2013	2014/0057330	8980606	03/17/2015
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FR	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
DE	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	602008038717.8	06/24/2015
HU	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
IT	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
NL	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
SI	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
ES	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
GB	KETOREDUCTASE POLYPEPTIDES FOR THE PRODUCTION OF AZETIDINONE	Granted	8836133.2	10/01/2008	2205727	2205727	06/24/2015
EP	BIOCATALYTIC PROCESS FOR PREPARING ESLICARBAZEPINE AND ANALOGS THEREOF	Published	12771861.7	11/06/2013	2697662		

IN	BIOCATALYTIC PROCESS FOR PREPARING ESLICARBAZEPINE AND ANALOGS THEREOF	Published	7967/CHENP/2013	10/01/2013	7967/CHENP/2013		
US	BIOCATALYTIC PROCESS FOR PREPARING ESLICARBAZEPINE AND ANALOGS THEREOF	Allowed	14/110964	12/05/2013	20140199735		
[***]	[***]	[***]	[***]	[***]			
US	BIOCATALYSTS AND METHODS FOR HYDROXYLATION OF CHEMICAL COMPOUNDS	Published	14/399034	11/05/2014	20150118719		
CN	BIOCATALYSTS AND METHODS FOR HYDROXYLATION OF CHEMICAL COMPOUNDS	Published	2013800362951	01/07/2015	104428412		
EP	BIOCATALYSTS AND METHODS FOR HYDROXYLATION OF CHEMICAL COMPOUNDS	Published	13788385.6	12/08/2014	2847327		
[***]	[***]	[***]	[***]	[***]			
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EP	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF SUBSTITUTED LACTAMS	Published	12769209.3	03/31/2014	2753640		
US	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF SUBSTITUTED LACTAMS	Allowed	14/342713	03/04/2014	2014/0342412		
CN	BIOCATALYSTS AND METHODS FOR THE SYNTHESIS OF SUBSTITUTED LACTAMS	Published	2012800547455	05/07/2014	103998461		
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CN	BIOCATALYSTS FOR THE PREPARATION OF HYDROXY SUBSTITUTED CARBAMATES	Published	2012800673299	07/17/2014	CN104053771		
EP	BIOCATALYSTS FOR THE PREPARATION OF HYDROXY SUBSTITUTED CARBAMATES	Published	12795954.2	06/06/2014	2780448		
[***]	[***]	[***]	[***]	[***]			
US	BIOCATALYSTS FOR THE PREPARATION OF HYDROXY SUBSTITUTED CARBAMATES	Allowed	14/357964	05/13/2014	20140322769		
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CN	BIOCATALYSTS AND METHODS FOR SYNTHESIZING DERIVATIVES OF TRYPTAMINE AND TRYPTAMINE ANALOGS	Published	2013800265947	11/21/2014	104508126		
EP	BIOCATALYSTS AND METHODS FOR SYNTHESIZING DERIVATIVES OF TRYPTAMINE AND TRYPTAMINE ANALOGS	Published	13765270.7	10/23/2014	2828385		
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US	BIOCATALYSTS AND METHODS FOR SYNTHESIZING DERIVATIVES OF TRYPTAMINE AND TRYPTAMINE ANALOGS	Allowed	14/386082	09/18/2014	20150072383		
US	ENGINEERED IMINE REDUCTASES AND METHODS FOR THE REDUCTIVE AMINATION OF KETONE AND AMINE COMPOUNDS	Published	13/890944	05/09/2013	20130302859A1		
EP	ENGINEERED IMINE REDUCTASES AND METHODS FOR THE REDUCTIVE AMINATION OF KETONE AND AMINE COMPOUNDS	Published	13724127.9	12/08/2014	2847214		
CN	ENGINEERED IMINE REDUCTASES AND METHODS FOR THE REDUCTIVE AMINATION OF KETONE AND AMINE COMPOUNDS	Published	2013800370394	01/12/2015	104428313		
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WO	ENGINEERED TRANSAMINASE POLYPEPTIDES FOR INDUSTRIAL BIOCATALYSIS	Published	PCT/US2014/018005	02/24/2014	WO2014/133960		
US	ENGINEERED IMINE REDUCTASES AND METHODS FOR THE REDUCTIVE AMINATION OF KETONE AND AMINE COMPOUNDS	Published	14/539690	11/12/2014	20150132807		
WO	ENGINEERED IMINE REDUCTASES AND METHODS FOR THE REDUCTIVE AMINATION OF KETONE AND AMINE COMPOUNDS	Published	PCT/US2014/065259	11/12/2014	WO2015/073555		
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IN	IMPROVED KETOREDUCTASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	514/CHENP/2006	08/11/2004		239120	03/09/2010

SG	IMPROVED KETOREDUCTASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	200600860-1	08/11/2004		119648	12/31/2008
US	KETOREDUCTASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	10/916,311	08/11/2004	20060195947A1	7629157	12/08/2009
US	KETOREDUCTASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	12/576,195	10/08/2009	20100028972A1	7833767	11/16/2010
EP	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	3785237.3	08/11/2003	1537222	1537222	03/09/2011
US	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	11/502,745	08/10/2006	20070161094A1	7807423	10/05/2010
US	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES AND VICINAL CYANO, HYDROXY SUBSTITUTED CARBOXYLIC ACID ESTERS	Granted	10/782,258	02/18/2004	US 2004-0214297 A1	7132267	11/07/2006
US	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	10/639,159	08/11/2003	US 2004-0137585 A1	7125693	10/24/2006
IN	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYR1C ACID DERIVATIVES	Granted	158/CHENP/2005	08/11/2003		220964	06/11/2008
SG	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	2005007634-8	08/11/2003		109875	08/31/2007
SG	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-RYDROXYBUTYRIC ACID DERIVATIVES AND VICINAL CYANO, HYDROXY SUBSTITUTED CARBOXYLIC ACID ESTERS	Granted	200600847-8	02/18/2004		119636	02/29/2008
JP	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	2004-528083	08/11/2003	2005-535330	4578240	09/03/2010

HK	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	5108017.7	08/11/2003		HK1074059	09/09/2011
FR	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	3785237.3	08/11/2003	1537222	1537222	03/09/2011
DE	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	3785237.3	08/11/2003	1537222	1537222	03/09/2011
IE	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	3785237.3	08/11/2003	1537222	1537222	03/09/2011
NL	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	3785237.3	08/11/2003	1537222	1537222	03/09/2011
GB	ENZYMATIC PROCESSES FOR THE PRODUCTION OF 4-SUBSTITUTED 3-HYDROXYBUTYRIC ACID DERIVATIVES	Granted	3785237.3	08/11/2003	1537222	1537222	03/09/2011
SG	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	200600859-3	08/11/2004		119647	02/27/2009
US	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	12/790,784	05/28/2010	US20100304459	7939309	05/10/2011
IN	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	521/CHENP/2006	08/11/2004		239922	04/09/2010
AU	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	2004288134	08/11/2004		2004288134	04/01/2010
US	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	10/915,927	08/11/2004	20050095619A1	7816111	10/19/2010
EP	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	1660648	10/09/2013

FR	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	1660648	10/09/2013
DE	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	602004043547.3	10/09/2013
IE	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	1660648	10/09/2013
NL	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	1660648	10/09/2013
CH	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	1660648	10/09/2013
GB	IMPROVED GLUCOSE DEHYDROGENASE POLYPEPTIDES AND RELATED POLYNUCLEOTIDES	Granted	4816807.4	08/11/2004	1660648	1660648	10/09/2013
US	HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	12/573,824	10/05/2009	US2010-0167345A1	8101395	01/24/2012
US	HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	10/917,179	08/11/2004	20050153417A1	7824898	11/02/2010
IN	IMPROVED HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	519/CHENP/2006	08/11/2004		239852	04/06/2010
SG	IMPROVED HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	200808477-4	11/14/2008	148180	148180	01/30/2014
US	IMPROVED HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	11/266,747	11/02/2005	20060099700A1	7588928	09/15/2009
US	IMPROVED HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	11/067,323	02/23/2005	US 2005-0272064 A1	7541171	06/02/2009
US	IMPROVED HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	12/505,374	07/17/2009	20090298125A1	8252554	08/28/2012

US	HALOHYDRIN DEHALOGENASES AND RELATED POLYNUCLEOTIDES	Granted	13/349,514	01/12/2012	US20120208259A1	8535910	09/17/2013
US	ALANINE 2,3-AMINOMUTASES AND RELATED POLYNUCLEOTIDES	Granted	11/919,271	03/20/2009	20100099143A1	7790432	09/07/2010
IN	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Pending	2322/CHENP/2009	10/01/2007			
SG	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	200901677-5	10/01/2010		150849	01/30/2014
EP	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	7843631.8	10/01/2007	2066788	2066788	07/23/2014
CN	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Allowed	200780036841.6	10/01/2007	101528917		
US	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	11/865696	10/01/2007	248539	7879585	02/01/2011
US	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	12/978,022	12/23/2010	US20110195465A1	8273547	09/25/2012
US	POLYNUCLEOTIDES ENCODING KETOREDUCTASES FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	13/571,248	08/09/2012	20130040364	8617864	12/31/2013
FR	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	7843631.8	10/01/2007	2066788	2066788	07/23/2014

DE	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	7843631.8	10/01/2007	2066788	602007037820.6	07/23/2014
GB	COMPOSITIONS AND METHODS FOR PRODUCING STEREOISOMERICALLY PURE STATINS AND SYNTHETIC INTERMEDIATES THEREFOR	Granted	7843631.8	10/01/2007	2066788	2066788	07/23/2014
US	ENZYMATIC CONVERSION OF EPDXIDES	Granted	11/833,933	08/03/2007	US2008/0220485	7695942	04/13/2010

Exhibit 1.29

Codexis Mayflower Patents

Attached.

EXHIBIT 1.29

CODEXIS MAYFLOWER PATENTS							
Country	**Application Title**	**Application Status**	**Application Number**	**Filing Date**	**Publication Number**	**Patent Number**	**Issue Date**
US	EVOLVING CELLULAR DNA UPTAKE BY RECURSIVE SEQUENCE RECOMBINATION	GRANTED	08/792409	02/03/1997		6096548	08/01/2000
US	EVOLVING CELLULAR DNA UPTAKE BY RECURSIVE SEQUENCE RECOMBINATION	GRANTED	09/430927	11/01/1999		6358742	03/19/2002
US	METHOD FOR PRODUCING POLYNUCLEOTIDES WITH DESIRED PROPERTIES	GRANTED	09/333762	06/15/1999		6337186	01/08/2002
US	HIGH THROUGHPUT MASS SPECTROMETRY	GRANTED	09/502,283	02/11/2000		7384387	06/10/2008
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	11/339090	01/24/2006	142950	7620502	11/17/2009
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	11/975638	10/18/2007	50782	7853410	12/14/2010
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	12/557463	09/10/2009	56385	7957912	06/07/2011

CODEXIS CONFIDENTIAL INFORMATION

US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	11/982405	10/31/2007	318795	7904249	03/08/2011
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	09/618579	07/18/2000		7024312	04/04/2006
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	09/539486	03/30/2000		7058515	06/06/2006
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	09/494282	01/18/2000	183934	6917882	07/12/2005
US	METHODS OF MAKING CHARACTER STRINGS, POLYNUCLEOTIDES & POLYPEPTIDES HAVING DESIRED CHARACTERISTICS	GRANTED	11/075231	03/07/2005	191688	7421347	09/02/2008
US	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	09/626929	07/27/2000		6319714	11/20/2001
GB	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
US	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	09/694863	10/23/2000		6521453	02/18/2003
US	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	11/987555	11/30/2007	171668	8029988	10/04/2011
US	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	12/557829	09/11/2009	184627	8058001	11/15/2011

CA	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	2320697	01/18/2000	2320697	2320697	11/18/2014
US	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	09/626595	07/27/2000		6479652	11/12/2002
EP	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
EP	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	ALLOWED	10075153.6	01/18/2000	2253704		
BE	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
DK	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
FR	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
DE	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
NL	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
CH	OLIGONUCLEOTIDE MEDIATED NUCLEIC ACID RECOMBINATION	GRANTED	909923.5	01/18/2000	1072010	1072010	04/21/2010
US	RECOMBINATION OF INSERTION MODIFIED NUCLEIC ACIDS	GRANTED	09/723520	11/27/2000		6413745	07/02/2002
US	RECOMBINATION OF INSERTION MODIFIED NUCLEIC ACIDS	GRANTED	09/723473	11/27/2000		6358740	03/19/2002
US	RECOMBINATION OF INSERTION MODIFIED NUCLEIC ACIDS	GRANTED	09/517933	03/03/2000		6365377	04/02/2002
US	OPTIMIZATION OF CROSSOVER POINTS FOR DIRECTED EVOLUTION	GRANTED	12/557434	09/10/2009	70192	8108150	01/31/2012
US	OPTIMIZATION OF CROSSOVER POINTS FOR DIRECTED EVOLUTION	GRANTED	11/818237	06/12/2007	20397	8224580	07/17/2012

US	OPTIMIZATION OF CROSSOVER POINTS FOR DIRECTED EVOLUTION	GRANTED	10/386903	03/10/2003	198988	7620500	11/17/2009
EP	OPTIMIZATION OF CROSSOVER POINTS FOR DIRECTED EVOLUTION	PUBLISHED	3711540.9	03/10/2003	1488335		
US	INTEGRATED SYSTEMS AND METHODS FOR DIVERSITY GENERATION AND SCREENING	GRANTED	11/677505	02/21/2007	15116	8014961	09/06/2011
US	INTEGRATED SYSTEMS AND METHODS FOR DIVERSITY GENERATION AND SCREENING	GRANTED	10/154936	05/23/2002	54383	7462469	12/09/2008
US	METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS	GRANTED	12/557746	09/11/2009	241640	8170806	05/01/2012
US	METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS	GRANTED	11/973805	10/09/2007	40045	7873499	01/18/2011
US	METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS	GRANTED	11/210239	08/22/2005	47611	7430477	09/30/2008
US	METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS	GRANTED	09/495668	02/01/2000	32010	6961664	11/01/2005
CA	METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS	GRANTED	2337949	01/18/2000	2337949	2337949	03/15/2011
US	METHODS OF POPULATING DATA STRUCTURES FOR USE IN EVOLUTIONARY SIMULATIONS	GRANTED	13/434261	03/29/2012	20120252684A1	8589085	11/19/2013
US	METHOD AND SYSTEM USING SYSTEMATICALLY VARIED DATA LIBRARIES	GRANTED	10/225564	08/20/2002		7873477	01/18/2011

US	METHOD AND APPARATUS FOR PREFERREED CODON DETERMINING SIMULATIONS	GRANTED	10/232770	08/30/2002		7702464	04/20/2010
US	METHOD AND APPARATUS FOR PREFERREED CODON DETERMINING SIMULATIONS	GRANTED	13/229228	09/09/2011		8457903	06/04/2013
EP	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	PUBLISHED	12/979,637	12/28/2010	20110161265		
JP	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	2003-573522	03/03/2003		5319865	07/19/2013
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	11/981577	10/30/2007	133143	7751986	07/06/2010
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	11/706034	02/12/2007	239364	7747393	06/29/2010
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	11/429628	05/05/2006	205003	8849575	09/30/2014
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10/629351	07/29/2003	161796	7747391	06/29/2010
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10/379378	03/03/2003	72245	7783428	08/24/2010
EP	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013

EP	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
EP	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
BE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
FR	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
GB	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
DE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
DK	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
BE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
GB	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
DE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
NL	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013

US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	PUBLISHED	14/256692	04/18/2014	2014/0249035		
FR	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
CH	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
DK	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181057.0	09/28/2010	2390803	2390803	11/20/2013
CH	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
NL	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	5779687.2	06/21/2005	1761879	1761879	08/14/2013
SE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
DK	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
FR	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
IE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
NL	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014

BE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
DE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	60346889.6	10/15/2014
HU	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
IT	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
CH	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
GB	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	3743748.0	03/03/2003	1493027	1493027	10/15/2014
DK	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
HU	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
IE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
IT	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
CH	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014

GB	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	PUBLISHED	14/536242	11/07/2014	20150065357		
DE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	60347028.9	11/19/2014
BE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
FR	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
NL	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
SE	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	10181000.0	09/28/2010	2278509	2278509	11/19/2014
US	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	GRANTED	11/981578	10/30/2007	132416	8762066	06/24/2014
EP	METHODS, SYSTEMS AND SOFTWARE FOR IDENTIFYING FUNCTIONAL BIOMOLECULES	ALLOWED	10181159.4	09/28/2010	2315145		

Exhibit 1.38

Designated Lab

[***]

Exhibit 1.60

In-License Agreements

[***]

Exhibit 1.63

In-Licensed Patents

Attached.

EXHIBIT 1.63

IN-LICENSED PATENTS							
Country	**Application Title**	**Application Status**	**Application No.**	**Filing Date**	**Publication No.**	**Pat. No.**	**Issue Date**
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
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Exhibit 1.97

Restricted Enzyme List

Attached.

EXHIBIT 1.97

RESTRICTED ENZYME LIST—Listed by Panel/Kit

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EXHIBIT 1.97

RESTRICTED ENZYME LIST—Listed by Panel/Kit

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[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

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[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

EXHIBIT 1.97

RESTRICTED ENZYME LIST—Listed by Panel/Kit

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EXHIBIT 1.97

RESTRICTED ENZYME LIST—Listed by Panel/Kit

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[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

EXHIBIT 1.97

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[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

EXHIBIT 1.97

RESTRICTED ENZYME LIST—Listed by Panel/Kit

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Exhibit 1.103

Technology Transfer Plan

Attached.

Technology Transfer Plan

Establishment of Codexis CodeEvolver® Directed Evolution Technology at Merck

Execution Version

CODEXIS CONFIDENTIAL INFORMATION

1. EXECUTIVE SUMMARY

The scope of this Plan is the full implementation of Codexis' biocatalyst screening and CodeEvolver® directed evolution technology within Merck, Sharp & Dohme Corp. ("MERCK") in order to augment MERCK's capabilities in cost efficient development and manufacture of MERCK Developed APIs. The complete transfer of Codexis Platform Technology to MERCK will be accomplished across the following two Waves:

Wave 1: Transfer of [***] to MERCK.

Wave 2: Enabling MERCK to practice the Platform Technology comprising:

a. Set-up of the Designated Lab; including access to the Codexis Software.
b. [***] in Codexis labs in Redwood City, CA ("RWC") [***]
c. [***] in the Designated Lab [***]
d. Training at Redwood City, CA in [***].

Codexis and MERCK will establish dedicated training Teams to facilitate the Technology Transfer. Codexis Team will include personnel for [***].

Likewise, dedicated MERCK Team will: (a) shadow Codexis Team and then conduct a Technology Transfer Project at MERCK, (b) set up and deploy equipment in MERCK's Designated Lab, and (c) provide general program management support. [***].

2. TECHNOLOGY TRANSFER PROGRAM SCOPE

2.1 WAVE 1: TRANSFER OF codexis Screening capabilities to MERCK

[***]

[***]

[***]

- **[***]**
    1. [***]

2. [***]
3. [***]
4. [***]
5. [***]

[***]

2.2 WAVE 2: ENABLING MERCK TO PRACTICE PLATFORM TECHNOLOGY

[***]

[***]

1) [***]
2) [***]
3) [***]
4) [***]

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- **[***]**
    1. [***]
    2. [***]
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        [***]
        [***]
    3. [***]

2. EVOLUTION PROGRAM

See Section 4.1 of Agreement. Evolution Programs must conclude within [***] from the Effective Date but shall not be considered part of Technology Transfer. Completion and/or success of Evolution Programs is not a condition to the Completion of Wave 1 or the Completion of Wave 2.

INDICATIVE GANTT CHART

[***]

3. Personnel competency requirements

Codexis will provide the following competencies to support successful technology transfer:

- [***]
- [***]
- [***]
- [***]
- [***]
- [***]
- [***]
- [***]
- [***]
- [***]
- [***]

APPENDIX I - TRANSFER OF MATERIALS (WAVE 1)

[***]

1) [***]

A) [***]

Platform	Short Name	# of 96-well Plates per Panel	# of Enzymes per Kit	Format	Quantity Provided
[***]	[***]	[***]	[***]	[***]	[***]
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B) [***]

- [***]
- [***]
- [***]

2) [***]

Platform	Short Name	Format	Number of Enzymes	Quantity Provided
[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]
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3) [***]

Platform	Short Name	Format
[***]	[***]	[***]
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APPENDIX II – EQUIPMENT LIST

Principal Equipment
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APPENDIX III – CODEXIS SOFTWARE LIST

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APPENDIX IV- PROTOCOLS AND SOP LIST

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Exhibit 3.4.2

Limitations on Codexis Mayflower Patents

Merck shall have no right under the Codexis Mayflower Patents with respect to:

(a) the making, having made, using and selling of reagents, instruments and services for the diagnostics and research supply markets, only as follows: (a) clinical and diagnostic tests, including those conducted to identify genetic disease predisposition, genetic or other disease conditions, and infectious or pathogenic agents, as well as those conducted for other medical, agricultural or veterinary purposes; (b) tests for analytical/bioanalytical purposes, including those conducted for biomedical, chemical, or medical research or treatment purposes, for environmental purposes, and for forensic purposes, including paternity, maternity or identity tests; and (c) sequencing and sequence analysis of nucleic acids or other biological polymers for any purposes; but excluding (i) the use of a reagent, other than a nucleic acid array, that specifically binds to selected cells, organs or tissue, and that is sold for medical use in procedures to image selected cells, organs or tissue, which procedure is carried out inside the body of an animal or human, and that requires FDA approval, and (ii) the sale of products and performance of services requiring a license under the In-Licensed Patents, to identify compounds that bind to receptors for use as pharmaceuticals;

(b) any (i) amino acid (including any natural, synthetic, modified or other amino acid analogue) chain that is a human or humanized protein, or any variant, homology, derivative, mutant or fragment thereof, and (ii) any molecule described in subsection (i) that is conjugated or otherwise coupled to any other molecule, in each of cases (i) and (ii) expressly including (iii)(A) any amino acid (including any natural, synthetic, modified or other amino acid analogue) chain that is a cytotoxic T lymphocyte associated antigen 4 or any variant, homolog, derivative, mutant or fragment thereof, and (B) any molecule described in subsection (iii)(A) that is conjugated or otherwise coupled to any other molecule, and (iv)(A) any amino acid (including any natural, synthetic, modified or other amino acid analogue) chain that is a human or animal protein or any variant, homolog, derivative, mutant or fragment of the foregoing, and (B) any molecule described in subsection (iv)(A) that is conjugated or otherwise coupled to any other molecule, and any pharmaceutical products that contain any of the foregoing as an ingredient;

(c) any formulation containing one or more antigens (or a nucleic acid sequence encoding an Antigen) in the form of (a) an infectious agent (e.g., bacteria, viruses, parasite, protozoa) whether live, attenuated or dead, (b) protein(s), (c) nucleic acid(s), (d) cells, spores and vectors (i.e., viruses or virus-like particles, liposomes, beads or other substrates for Antigen presentation), (e) fragments of any of the foregoing, or (f) a combination of any of the preceding, which formulation is administered or is intended to be administered to induce an Antigen-Specific Response in the human or

animal recipient to at least one such antigen for the prevention of the onset of, or treatment of, a disease state, symptom or condition in humans or animals caused by an infectious agent; where "Antigen" means a molecule (e.g., protein, nucleic acid, polypeptide, peptide, carbohydrate, glycoprotein, glycolipid or any combination of the foregoing) that is produced naturally by, or is derived in whole or in part from, an infectious agent (e.g., bacteria, viruses, parasite, protozoa) that produces an Antigen-Specific Response to such molecule in a human or animal recipient (but excluding any molecule that is derived from, in whole or in part, any human gene or protein); and "Antigen-Specific Response" means an immune state resulting from the modulation of activity (i.e., an increase, decrease or qualitatively different activity) or one or more lymphoid cells (e.g., B cells, NK cells, T cells or professional antigen-presenting cells, such as monocytes, macrophages, Langerhans cells, dendritic cells) following the administration of a stimulus, where such immune state is induced in a human or animal recipient to an Antigen that is specifically directed to the subject Antigen;

(d) the development, production and/or sale of any and all polypeptides more than twelve (12) amino acids in length, and the development of organisms and vectors (including without limitation plant vectors and plant hosts) for the expression of such polypeptides, in the areas of (a) processes for textile or garment production, (b) processes for the production of leather, (c) cleaning processes or cleaning products, (d) starch processing, (e) food production processes, (f) animal feed processing, (g) personal care processes, excluding pharmaceutical products and oral, topical and intravaginal medications, (g) the processing of wood, paper, pulp and derived lignin and cellulose, (i) oil drilling, (j) dyestuffs and dyeing processes, (k) electronics industry waste water treatment, (l) detoxification of pesticides, chemical weapons and biological weapons, (m) utilization of industrial waste or co-products to generate energy, compost or industrial raw materials including fermentable substrates for e.g. citric acid production from agricultural waste, (n) polymer production, modification or processing of polymers (tetramers of higher) from monomers (including polymers made by addition of dimers or trimers for reactions proceeding to completion in the same reactor), and the enzymatic modification of chemically synthesized polymers, (o) waste water treatment, sewage sludge treatment or cleanup of contaminated soil, (p) synthesis of fuels including bio-diesel and hydrogen, and (q) bioremediation of water, soil and municipal waste, including without limitation biological waste, sewage and sludge (including without limitation biological waste treatment and cleaning of sewer and drain pipes).

(e) any and all human or humanized granulocyte-colony stimulating factor (G-CSF) protein, or any and all variants, derivatives, mutants or fragments thereof, and any and all pharmaceutical products that contain any of the foregoing.

Exhibit 3.4.4

Third Party Enzyme Supplier(s)

[***]

[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

Exhibit 4.2

Statement of Work Form

Attached.

[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

STATEMENT OF WORK NO. ____

Codexis, Inc. ("Codexis")
200 Penobscot Dr.
Redwood City, CA 94063

_____("Merck")
_____
_____

This Statement of Work No. (this "Statement of Work"), effective as of _____ (the "Statement of Work Effective Date") is made by and between Merck and Codexis and is subject to the terms and conditions of the Platform Technology Transfer and License Agreement dated as of _____, 2015 ("Platform Technology Transfer and License Agreement"), to which this Statement of Work is attached and incorporated therein.

I. [***]

[***]

[***]

[***]

II. [***]

[***]

[***]

III. [***]

[***]

IV. [***]

[***]

V. [***]

[***]

VI. [***]

[***]

The Parties have executed this Statement of Work by their respective duly authorized representatives on the dates identified below but the Statement of Work shall become effective as of the Statement of Work Effective Date.

CODEXIS, INC. _____

By: _____ By: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: __ Date: _____

Exhibit 4.3

Approved Subcontractors

[***]

[***] Certain information in this document has been omitted and filed separately with the Securities and Exchange Commission. Confidential treatment has been requested with respect to the omitted portions.

Exhibit 10.5.1

Press Release

Attached.

Execution Version

CODEXIS®
WE ARE BIOCATALYSIS™

Codexis Announces CodeEvolver Technology Transfer and License Agreement with Merck

Codexis to Receive $5 Million in Upfront Payment

Codexis to Hold Conference Call on [Day/Date] at [xx:xx a.m./p.m.] Eastern Time

REDWOOD CITY, Calif. (August XX, 2015) – Codexis, Inc. (NASDAQ: CDXS), a leading developer of biocatalysts for the pharmaceutical and fine chemical industries, announces the signing of a CodeEvolver® platform technology license agreement with Merck, known as MSD outside the United States and Canada, through a subsidiary. This transaction marks the second CodeEvolver licensing agreement between Codexis and a major pharmaceutical company and advances the technology's business model of multiple sources of revenue.

Under the terms of the agreement, Codexis has granted Merck a non-exclusive license to use Codexis' proprietary CodeEvolver protein engineering platform technology to develop novel enzymes for use in the manufacture of Merck's pharmaceutical products. Upon completion of the technology transfer a Codexis' CodeEvolver protein engineering platform will be located at a Merck research site.

Codexis is eligible to receive up to $18 million over approximately the next 15 to 24 months, $5 million of which will be paid upon the signing of this agreement and an additional $13 million subject to the satisfactory completion of certain technology transfer milestones. Codexis will also be eligible to receive payments of up to maximum of $15 million for each pharmaceutical ingredient (API) using novel enzymes developed by Merck using the CodeEvolver technology and used for commercial manufacturing purposes.

"This licensing transaction builds upon our productive eight-year relationship with Merck and further validates the ability of CodeEvolver to effectively and cost-efficiently improve certain manufacturing

processes," stated John Nicols, President and CEO of Codexis. "We view licensing agreements involving our CodeEvolver technology such as this one with Merck as an attractive component of our business model. It allows us to monetize our core technology, while continuing to provide services and supply products to customers under our traditional business model."

"This technology transfer and licensing agreement builds upon our long standing collaboration in biocatalysis with Codexis," said Rich Tillyer, senior vice president, and head of Global Chemistry, Merck Research Laboratories. "Increased access to the CodeEvolver technology positions Merck to potentially expand upon the use of enzymes in its pharmaceutical manufacturing processes."

Conference Call

Codexis will hold a conference call on [day/date/time] to discuss this announcement and answer questions. The conference call dial-in numbers are [phone number] for domestic callers and [phone number] for international callers, and passcode [code]. A live webcast of the call will be available on the Investors section of www.codexis.com.

A recording of the call will be available for 48 hours beginning approximately two hours after the completion of the call by dialing [phone number] for domestic callers or [phone number] for international callers. Please use the passcode [code] to access the replay. A webcast replay will be available on the Investors section of www.codexis.com for 30 days, beginning approximately two hours after the completion of the call.

About CodeEvolver® Protein Engineering Platform Technology

CodeEvolver is Codexis' proprietary protein engineering platform, which enables rapid development of custom-designed enzymes that are highly optimized for efficient manufacturing processes. The CodeEvolver platform is comprised of proprietary methods for the optimization of proteins through the design and generation of diverse genetic libraries, automated screening techniques, algorithms for the interpretation of screening data and predictive modelling. The Codexis CodeEvolver platform technology is covered by more than 150 issued patents and pending patent applications worldwide.

About Codexis, Inc.

Codexis, Inc. is a leading protein engineering company that applies its technology to the development of biocatalysts for commercial manufacture of pharmaceuticals and fine chemicals. Codexis' proven

technology enables implementation of biocatalytic solutions to meet customer needs for rapid, cost-effective and sustainable manufacturing. For more information, see www.codexis.com.

Forward-Looking Statements

This press release contains forward-looking statements relating to Codexis' expectation that it will receive up to $18 million over approximately the next 15 to 24 months under the agreement, the potential for Codexis to receive product-related payments of up to $15 million for each Merck-developed API that is manufactured using one or more enzymes that have been developed using the CodeEvolver protein engineering platform technology, and the establishment of a protein engineering lab at a designated Merck research site. You should not place undue reliance on these forward-looking statements because they involve known and unknown risks, uncertainties and other factors that are, in some cases, beyond Codexis' control and that could materially affect actual results. Factors that could materially affect actual results include Codexis' dependence on its collaborators; Codexis' dependence on a limited number of products and customers; potential adverse effects to Codexis' business if its customers' pharmaceutical products are not received well in the markets; Codexis' ability to retain key personnel; Codexis' reliance on customers to provide timely information in order for Codexis to report its financial results in an accurate and timely fashion; Codexis' ability to compete may decline if it loses some of its intellectual property rights; third party claims that Codexis infringes third party intellectual property rights; and Codexis could face increased competition if third parties misappropriate Codexis biocatalysts. Additional factors that could materially affect actual results can be found in Codexis' Annual Report on Form 10-K filed with the Securities and Exchange Commission ("SEC") on March 6, 2015, including under the caption "Risk Factors," and in Codexis' Quarterly Report on Form 10-Q filed with the SEC on May 7, 2015. Codexis expressly disclaims any intent or obligation to update these forward-looking statements, except as required by law.

Contact:

Investors
LHA
Jody Cain, 310-691-7100
jcain@lhai.com

Notch Communications
Kate Whelan, +46 (0)70 238 11 49
Kate.whelan@notchcommunications.co.uk

# # #

Execution Version

Consent of Independent Registered Public Accounting Firm

Codexis, Inc.
Redwood City, California

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (Nos. 333-167752, 333-172166, 333-179903, 333-187711, 333-194524, 333-202596, 333-210022, 333-216587, 333-223693, 333-224885, 333-230037, and 333-232262) and Form S-3ASR (Nos. 333-228693 and 333-255926) of Codexis, Inc. of our reports dated February 28, 2022, relating to the consolidated financial statements, and the effectiveness of Codexis, Inc.'s internal control over financial reporting, which appear in this Form 10K.

/s/ BDO USA, LLP
San Jose, California

February 28, 2022

Exhibit 31.1

CERTIFICATION

I, John J. Nicols, certify that:

1. I have reviewed this Annual Report on Form 10-K of Codexis, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2022

/s/John J. Nicols

John J. Nicols
President and Chief Executive Officer

Exhibit 31.2

CERTIFICATION

I, Ross Taylor, certify that:

1. I have reviewed this Annual Report on Form 10-K of Codexis, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2022

/s/Ross Taylor

Ross Taylor

Senior Vice President and Chief Financial Officer

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Codexis, Inc. (the "Company") on Form 10-K for the fiscal year ended December 31, 2021, as filed with the Securities and Exchange Commission (the "Report"), John J. Nicols, President and Chief Executive Officer of the Company and Ross Taylor, Senior Vice President and Chief Financial Officer of the Company, respectively, do each hereby certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

- The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- The information in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 28, 2022

/s/John J. Nicols
John J. Nicols
President and Chief Executive Officer

/s/Ross Taylor
Ross Taylor
Senior Vice President and Chief Financial Officer