

2.CODEXIS APPLICATIONS IN THE PHARMACEUTICAL INDUSTRY

Our technology platform enables us to deliver solutions to our customers in the pharmaceutical 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 technology platform allows us to provide benefits to our customers in a number of ways, including:

- reducing the use of raw materials and intermediate products;
- improving product yield;
- using water as a primary solvent;
- performing reactions at or near room temperature and pressure;
- eliminating the need for certain costly manufacturing equipment;
- reducing energy requirements;
- reducing the need for late-stage purification steps;
- eliminating multiple steps in the manufacturing process; and
- eliminating hazardous inputs and harmful emission by-products.

Early in the product lifecycle, customers can use our services to achieve speed to market and to reduce manufacturing costs. If an innovator incorporates our products or processes into an FDA-approved product, we expect the innovator to continue to use these products or processes for the patent life of the approved drug.

After a product is launched, customers also use our services to reduce manufacturing costs. At this stage, changes in the manufacturing process originally approved by the FDA may require additional review. Typically, pharmaceutical companies will only seek FDA approval for a manufacturing change if there is a substantial cost savings associated with the change. 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 FDA approval of the new processes which incorporate our biocatalysts. Moreover, we believe these cost savings are attractive to generics manufacturers, who compete primarily on price.

We are currently working with customers on approximately 35 pharmaceutical products in various stages of the pharmaceutical product lifecycle.

CODEXIS PRODUCTS FOR THE PHARMACEUTICALS MARKET

Codex™ Biocatalyst Panels. We sell Codex™ Biocatalyst Panels to customers who are engaged in both drug development and the marketing of approved drugs to allow them to screen and identify possible biocatalytic manufacturing processes for their drug candidates and their marketed products. Our Codex Biocatalyst Panels are plates embedded with genetically diverse variants of our proprietary biocatalysts, which allow our customers to determine whether a biocatalyst produces a desired activity that is applicable to a particular process.

For compounds that are in development, our Codex Biocatalyst Panels:

- allow innovators to rapidly and inexpensively screen and identify possible biocatalytic manufacturing processes for many of their drug candidates in-house, without the risks of disclosing the composition of their proprietary molecules before they have received patent protection; and
- generate data that we can use to rapidly optimize biocatalysts for a particular reaction, if necessary, reducing the time required to generate a manufacturing process capable of supporting clinical trials with inexpensively produced, pure drugs.

We believe that our Codex Biocatalyst Panels have helped us build early and broad awareness of the power and utility of our technology platform, and will increasingly lead to sales of our biocatalyst optimization services and biocatalysts, as well as intermediates and APIs made using our biocatalysts. We currently have over ten customers for our panels, including leading pharmaceutical companies such as F. Hoffman-La Roche Ltd., GlaxoSmithKline plc, Merck, Novartis and Pfizer. If our customers incorporate a biocatalytic manufacturing process early in a product's lifecycle, they can reduce their manufacturing costs throughout that lifecycle, while we, in turn, could realize a long term revenue stream resulting from the use of our biocatalysts during that time. In addition, our Codex Biocatalyst Panels are increasingly used by our customers to evaluate the feasibility of changing the manufacturing process for their marketed products to a biocatalyst-enabled process.

Biocatalyst screening services. If a customer prefers, rather than subscribing to our Codex Biocatalyst Panels to use for their own screening, they can send us their materials to test against our existing libraries of biocatalysts. If we detect desired activity in a specific biocatalyst, we can supply the customer with this biocatalyst or perform optimization services to improve the performance of the biocatalyst.

Our screening services:

- allow innovators to rapidly and inexpensively screen and identify possible biocatalytic manufacturing processes through access to our extensive biocatalyst libraries; and
- generate data that we can use to rapidly optimize biocatalysts for a particular reaction, if necessary, reducing the time required to generate a manufacturing process capable of supporting the customers' particular needs, ranging from small quantities for clinical trials to full commercial production, in all cases providing inexpensively produced, pure drugs.

We have provided screening services to numerous innovator and generic pharmaceutical manufacturers.

Biocatalyst optimization services. We work with our customers throughout the pharmaceutical product lifecycle to customize proprietary biocatalysts, resulting in optimized biocatalysts that have been evolved specifically to perform a desired process according to a highly selective set of specifications.

Our biocatalyst optimization services:

- allow innovators to improve the manufacturing process as their drug candidates progress through preclinical and clinical development, deferring or reducing the need for significant manufacturing investment until the likelihood of commercial success is more certain; and
- enable manufacturing processes that are highly efficient, inexpensive, require relatively little energy, reduce the need for hazardous reagents, and reduce waste. For example, our activities with Pfizer have included developing an optimized biocatalytic manufacturing process for a key intermediate that eliminates three chemical steps.

Biocatalysts. We supply varying quantities of our proprietary biocatalysts to pharmaceutical companies, from small to moderate quantities while they are optimizing their production processes, to larger quantities during later-stage clinical development and commercial scale drug production.

Our biocatalysts:

- enable innovators to manufacture products more efficiently during preclinical and clinical development using optimized biocatalytic processes, with relatively low investment;
- eliminate the need for innovators to invest in the development of complex chemical synthesis routes during the development stage;
- allow innovators to achieve higher product purity during the development stage prior to investing in expensive late-stage clinical trials;
- reduce the risk of adverse effects arising from product impurities;
- allow the removal of entire steps from synthetic chemical production routes during commercial scale production, reducing raw material costs, energy requirements and the need for capital expenditures; and
- decrease the manufacturing costs for our customers.

For instance, as a part of our ongoing collaboration with Merck, we have developed a biocatalyst for use in a new manufacturing process for sitagliptin, the API in Merck's pharmaceutical product Januvia. Januvia is Merck's first-in-class medication for the treatment of Type II diabetes. Merck's current manufacturing process uses a high pressure chemo-catalysis platform, which requires the use of highly specialized equipment. The new biocatalyst-enabled process runs at atmospheric pressure, eliminates the need for certain highly specialized equipment and increases overall product yield.

Intermediates and APIs. We can supply our customers intermediates and APIs made using our biocatalysts throughout the drug lifecycle.

Our supply of intermediates has the following uses and benefits:

- lowers capital investment for innovators through outsourcing of manufacturing; and
- provides a source of less expensive, more pure products to innovator and generics manufacturers.

In the innovator market, we are currently supplying Pfizer with an intermediate in the manufacture of Lipitor. In February 2010, we entered into a collaboration with Dishman Pharmaceuticals and Chemicals, Ltd., or Dishman, a global manufacturer of intermediates and APIs located in India, to expand the application of our technology to a broader pipeline of innovator pharmaceutical products. Under our agreement with Dishman, we will work with Dishman exclusively, subject to certain exceptions, with respect to the manufacture and supply of intermediates and APIs using our biocatalysts for a select group of innovators. Dishman will also be our preferred contract manufacturing organization partner for new opportunities with other innovator pharmaceutical companies.

We have also developed biocatalysts for use in the manufacture of certain generic intermediates and APIs by various companies, including Arch and Teva Pharmaceutical Industries Ltd., or Teva. In addition, we have launched and are marketing several new intermediates and APIs for the generic equivalents of branded pharmaceutical products, including Singulair and Cymbalta, for sale in markets where innovators have not sought patent protection for their products and intend to sell these same intermediates and APIs for use in markets where innovators have sought patent protection when the patent protection for each product expires.