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World Enzymes

Industry Study with Forecasts for **2011 & 2016**

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Global enzyme demand will be driven by continued robust growth in pharmaceutical and biocatalyst enzymes demand, and the rapid expansion in bioethanol production from grains.

Global demand to rise 7.6% annually through 2011

The world market for enzymes will grow 7.6 percent per year to \$6 billion in 2011, driven by continued robust growth in pharmaceutical enzyme demand, double-digit increases in demand for biocatalysts for pharmaceutical and other fine chemical production, and the rapid expansion in bioethanol production from grains. The fastest growth will be in the Asia/Pacific and other developing regions as rising per capita incomes lead to more intensive use of enzymes, with North America and Western Europe trailing behind. Downward pricing pressure in most markets will restrain further growth, although the introduction of more efficient, higher priced enzymes will boost average unit pricing values.

Specialty enzyme markets to outpace industrial uses

Among specialty enzyme markets, continued rapid gains in botulinum toxin-based neuromodulator and enzyme replacement therapy (ERT) drugs will boost the pharmaceutical segment, offsetting slower growth in digestive enzymes and thrombolytics. The importance of biologically-derived chemicals will also be apparent in the biocatalyst market as chemical and pharmaceutical companies increasingly utilize these powerful enzymes to replace expensive precious metal-based catalysts as they optimize specialty and fine chemical production.



Among industrial enzymes, growing market maturity in North America and Europe, as well as potentially devastating avian and pork diseases in the Asia/Pacific region, will moderate advances in animal feed enzyme demand to near the global enzyme demand average. Similarly, food and beverage enzyme demand will also moderate to near the global average, though new applications and rapid expansion in the Asia/Pacific region will ensure growth remains strong. Among other markets, gains will be healthy in diagnostics, and research and biotechnology, while the maturity of cleaning products, and textiles and leather, results in slower advances.

Carbohydrases to be fastest growing product

Carbohydrases will achieve the greatest gains in enzyme demand by product, based on the strength of their use in pharmaceuticals, food and beverages, and ethanol production. The fastest growth will be in lipases due to the rapid gains in biocatalyst enzyme demand, as well as growing use of enzymes for oil seed processing and the transesterification of fats in food and beverages. Polymerase and nuclease demand will be strong, but trail the global average, as intense competition continues to impact prices. Advances in proteases will also trail the global average, with proteases held back by maturity in key markets.

Sample Text & Tables

ASIA/PACIFIC

Enzyme demand in India is concentrated in industrial en particularly the cleaning products (detergents), food and bev textile and leather markets. enzyme usage rates are sign Japan, North America and V be traced to government pol companies to grow above a capital for modernization an smaller companies have lack ernize their operations with the newer, more efficient technol make greater use of enzymes. Recent moves by the Indian g to address the situation are expected to help, and significantly increase enzyme usage rates.

In specialty enzymes, most demand is concentrated in the pharma ceutical enzyme market. Growth is expected to be robust going forward as the reform of India's patent law to better reflect the laws in the United States and Western Europe encourages western companies to enter the Indian market. Additionally, India's rising middle class will ter able to afford the higher cost enzyme medications. In a the pharmaceutical market, strong growth will also be seen and biotechnology as the government seeks to promote dev the biotechnology sector as a showcase of the country's tec prowess. The growing global importance of the Indian pha industry will also benefit the biocatalysis market.

Both domestic and foreign producers serve the enzym India. Leading foreign companies include AB Enzymes, D nencor), Dyadic, Enzyme Development Corporation, and N The largest domestic producers are Advanced Enzyme Tech Maps (India), though, as with other industries, a significant smaller producers are also present. As consolidation occurs

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**SAMPLE
TEXT**

TABLE VII-8

INDIA -- ENZYME DEMAND BY TYPE & MARKET (million dollars)

Item	1996	2001	2006	2011	2016
Enzyme Demand					
By Type:					
Carbohydrase					
Protease					
Other Enzymes					
By Market:					
Industrial					
Food & Beverage					
Other Industrial					
Specialty					
% India					
Asia/Pacific Enzyme Demand					

**SAMPLE
TABLE**

TABLE VII-7

INDIA -- ECONOMIC INDICATORS

Item	1996	2001	2006	2011	2016
Population (mil persons)					1277
\$ GDP/per capita					70
Gross Domestic Product (bil 2005\$)					50
Mfg Value Added (bil 2005\$)					79
Food Mfg Value Added (bil 2005\$)					4
Soap & Detergent Shipments(bil \$)					0
Animal Feed Shipments (bil \$)					1
Pharmaceutical Shipments (bil \$)					5
\$ enzyme/mil \$ GDP					32
Enzyme Demand (mil \$)					250

**SAMPLE
TABLE**

Sample Profile, Table & Chart

COMPANY PROFILES

PDL BioPharma Incorporated

34801 Campus Drive
 Fremont, CA 94555
 510-574-1400
<http://www.pdlbiopharma.com>

Revenue
 Geograph
 15%, and
 Employ

Key Pro
 ceuticals

PDL BioPharma is a company focused on discovering, developing and commercializing innovative therapies for severe or life-threatening illnesses. The Company's products are primarily sold in acute-care hospital settings in the US and Canada. In addition, PDL BioPharma receives royalties through licensing agreements with numerous biotechnology and pharmaceutical companies based on its antibody humanization technology platform.

The Company is active in the world enzymes industry through the supply of RETAVASE, an enzyme-based pharmaceutical used in the treatment of acute myocardial infarction (AMI). RETAVASE, which accounted for \$31 million of PDL BioPharma's total 2006 revenues, is a fibrinolytic, or clot-busting, pharmaceutical that features a recombinant form of the tissue plasminogen activator (tPA) enzyme reteplase manufactured via recombinant DNA technology. Specific RETAVASE utilizes a recombinant form of the tPA enzyme reteplase which is a thrombolytic agent that works to convert the body's plasminogen into plasmin, an enzyme that helps to break down blood clots.

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SAMPLE PROFILE

TABLE III-3

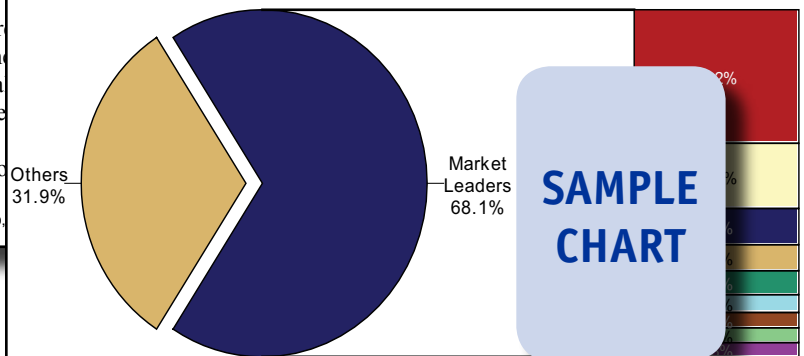
WORLD FOOD & BEVERAGE ENZYME DEMAND BY MARKET & REGION (million dollars)

Item	1996	2001	2006	2011	2016
World Food & Bev MVA (bil 2005\$)	17	20	23	27	30
\$ enzymes/000\$ food & beverage	0	0	0	0	0
World Food & Bev Enzyme Demand					
By Market:					
Dairy					
Bakery					
Other Food & Beverage					
By Region:					
North America					
Western Europe					
Asia/Pacific					
Other Regions					
% food & beverage	2	2	2	2	3
World Industrial Enzyme Demand	1475	1500	1550	1610	1675

SAMPLE TABLE

CHART IX-1

WORLD ENZYME MARKET SHARE, 2006 (\$4.1 billion)



SAMPLE CHART

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OTHER STUDIES

In Vitro Diagnostics

US demand for in vitro diagnostic (IVD) products will grow 5.1% annually through 2011. Clinical chemistry and immunoassay methods will remain the top two IVD sciences, while nucleic acid testing products will continue to generate the fastest gains. Hospital labs will stay the largest market while home health care will grow the fastest. This study analyzes the \$15.2 billion US IVD industry to 2011 and 2016 by product, application and market. It also evaluates company market share and profiles major players.

#2175 04/2007 \$4500

World Catalysts

The world catalyst market will reach \$12.3 billion in 2010, driven by growing demand in the chemical, polymer and refining industries for more energy efficient processes and products. Polymer catalysts will grow the fastest while chemical synthesis types will remain dominant. Organometallics will lead gains by material. This study analyzes the global catalyst industry to 2010 and 2015 by material, product, market, world region and for 18 countries. It also evaluates market share and profiles industry participants.

#2125 01/2007 \$5500

Alternative Sweeteners

US demand for alternative sweeteners will grow 4% annually through 2010. Products such as sucralose, erythritol and xylitol will gain market share over more established products like aspartame and sorbitol. Newer types such as stevia and agave nectar will grow the fastest, hoping to appeal to consumers wary of high intensity sweeteners. This study analyzes the \$935 million US alternative sweetener industry to 2010 and 2015 by product and market. It also details company market share and profiles major players.

#2138 01/2007 \$4300

Industrial & Institutional Cleaning Chemicals

US demand for industrial and institutional (I&I) cleaning chemicals will grow 3.8% annually through 2010. Value gains will be boosted by more multifunctional and concentrated types. Disinfectants and sanitizers will grow the fastest based on heightened safety and health concerns. Specialty surfactants and additives will pace raw materials. This study analyzed the \$8.3 billion I&I cleaning chemical industry to 2010 and 2015 by material, product and market. It also details company market share and profiles major players.

#2117 10/2006 \$4400

Enzymes

US enzymes demand will grow 6.9% annually through 2010, based on strong gains in key markets such as animal feed, biocatalysts, pharmaceuticals and starch processing. Pharmaceuticals will remain the largest market and one of the fastest growing. The most rapid growth will occur in animal feed additives, led by phytase. This study analyzes the \$1.6 billion US enzyme industry to 2010 and 2015 by product and market. It also considers market environment factors, details market share and profiles major players.

#2092 08/2006 \$4300

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