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Enzymes

US Industry Study with Forecasts for **2012 & 2017**

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Growth in the US market will be dominated by the rapid expansion of the fuel ethanol industry, as ethanol producers strive to meet renewable fuel mandates specified in recent legislation.

US demand to rise 6% annually through 2012

US demand for enzymes is expected to rise 6.0 percent per year to \$2.5 billion in 2012. Advances will be led by continued rapid expansion in the fuel ethanol segment of the starch processing enzyme market, as well as strong growth in the large pharmaceutical and smaller biocatalyst and pulp and paper markets. Animal feed will also contribute to gains, expanding at an above average pace going forward. In other markets, healthy, though below average, gains will be realized in diagnostics, research and biotechnology, and cosmetics and toiletries, offset somewhat by maturity in food and beverages, and cleaning products applications.

Growth in the US enzyme industry will be dominated by the rapid expansion of the fuel ethanol industry, as ethanol producers strive to meet the country's renewable fuel needs specified in the Energy Independence and Security Act of 2007. Even as the country reaches a practical limit on how much corn it can convert into ethanol, the rise of cellulosic biomass ethanol production will continue to drive rapid enzyme demand growth over the longer term.

Pharmaceuticals to remain largest market

Pharmaceuticals, which will remain the largest enzyme market going forward, will also achieve above average growth. Advances will stem from continuing

Pharmaceutical 29%
Starch Processing 15%
Research & Biotechnology 13%
Food & Beverage Processing 12%
Other Types 31%

US Enzymes Demand, 2007 (\$1.9 billion)



strong demand for neuromodulators, as well as orphan drug enzymes for treating lysosomal storage disorders. Fast expansion in smaller pharmaceutical applications such as cancer treatment and wound debridement will also support gains.

As enzymes often enable more energy efficient processes, high energy prices will lead to rapid increases in demand in areas such as biocatalysts and the pulp and paper industry, as well as ongoing healthy expansion in the more mature food and beverage and cleaning product markets. The research and biotechnology market will benefit from technological advancements over the past decade that have expanded the scope of bio-

technology applications, and accelerated the pace of advanced discovery and process optimization. Many of these advancements will also spur growth in the diagnostic market as new tests are developed to address issues in food safety, forensics and medicine.

Reflecting the impact of higher feed costs on livestock farmer budgets and generally high market penetration, growth in animal feed enzyme demand will moderate significantly from historical levels over the short term. However, by 2012 farmer efforts to maximize nutrient uptake and minimize feed costs will continue to support strong annual increases in demand, with cellulases and phytase both benefitting.

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Sample Text, Table & Chart

MARKETS

Enzyme Demand

Demand for diagnostic enzymes is projected to advance per annum to \$1 billion by 2017. This growth will be fueled by increased emphasis on self-treatment, and diagnostic and diagnostic tests, as well as forensic diagnostic tests. Additional factors will include demand for faster and more accurate tests, the use of value enzymes. Additional factors will include the use of reusable immobilized enzymes and competition from products targeting the point-of-care testing segment.

In general, enzyme-based diagnostics are more specific than chemical tests. This has helped drive demand, particularly as volumes have risen and per test prices have dropped. Greater availability of the newer, rapid diagnostic tests has also increased customer acceptance of the newer diagnostic methods. For example, the use of immobilized enzymes in biosensors has reduced the cost of some enzyme-based diagnostics to a few pennies per use and is driving demand in applications where quick results and simple sample preparation are desired.

Enzymes are used in autoanalyzers, immunoassays and test strips, primarily for blood glucose and urea testing, although the range of available tests and demand for them are rapidly expanding due both to the development of more accurate and specific enzymatic methods, and to the improved price competitiveness of the tests. Main analytes measured enzymatically include cholesterol, triglycerides, glucose, carbon dioxide, ammonia, alcohol, oxalate, urea and uric acid. Other commercial applications include diagnostic tests for infectious diseases such as those caused by hepatitis C viruses, Chlamydia trachomatis, Borrelia burgdorferi, Mycobacterium tuberculosis, and pathogens such as E. coli and other enzyme-sensitive substances. In addition, enzyme-based tests for

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**SAMPLE
TEXT**

TABLE IV-4

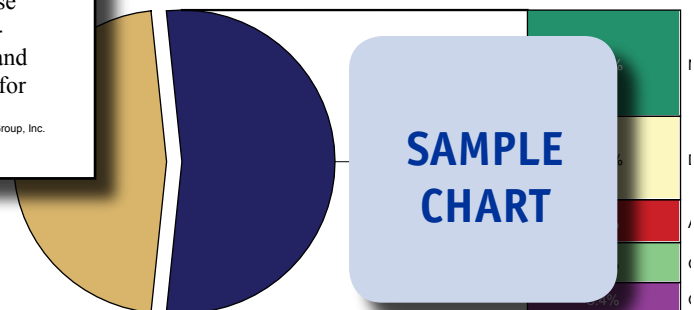
REPLACEMENT THERAPY ENZYME DEMAND
(million dollars)

Item	1997	2002	2007	2012	2017
Resident Population (million)	270	275	280	285	290
\$ enzyme/000 capita	10	12	15	18	22
Replacement Therapy Enzymes					
By Pharmaceutical:					
Imiglucerase (CEREZYME)	10	12	15	18	22
Other	10	12	15	18	22
By Product:					
Carbohydrase	10	12	15	18	22
Other	10	12	15	18	22
% enzyme replacement	10	12	15	18	22
Pharmaceutical Enzyme Demand	20	24	30	36	44

**SAMPLE
TABLE**

CHART VI-1

ENZYME MARKET SHARE, 2007
(\$1.9 billion)



**SAMPLE
CHART**

Sample Profile, Table & Chart

COMPANY PROFILES

Valley Research Incorporated

3502 North Olive Road
 South Bend, IN 46628
 574-232-5000
<http://www.valleyresearch.com>

Annual Sales:
 Employment:

Key Products: production, winemaking, s, and dietary supplement app

Valley Research is a privately held producer of enzymes for the food industry. The Company's operations include manufacturing and laboratory facilities, and an administration and marketing center at its headquarters, as well as sales offices in France, Argentina and China. In addition, Valley Research's products are available through a worldwide network of distributors.

The Company participates in the US enzyme industry primarily through the manufacture and marketing of carbohydrase, protease and lipase enzymes for the food industry. Valley Research's portfolio includes a variety of animal, plant and microbially derived enzymes designed for use in fruit and vegetable juice production, winemaking, savory flavor development, functional foods, and dietary supplement applications.

Valley Research's enzymes for fruit and vegetable juice production are made and sold under the CRYSTALZYME brand name. Among CRYSTALZYME enzymes are pectinases, cellulases and arabinases used to aid in such fruit and vegetable processing applications as

**SAMPLE
PROFILE**

TABLE V-11

PROTEASE DEMAND BY PRODUCT & MARKET (million dollars)

Item	1997	2002	2007	2012	2017
Nondurable Goods Shipments (bil \$)	10,000	12,000	14,000	16,000	18,000
\$ protease/mil \$ nondurables					
Protease Demand					
By Product:					
Microbial Protease					
Fibrinolytic Protease					
Rennet/Chymosin					
Other Protease					
By Market:					
Pharmaceutical					
Research & Biotechnology					
Food & Beverage Processing					
Cleaning Product					
Other Markets					
% protease					
Total Enzyme Demand	107	129	169	216	274

**SAMPLE
TABLE**

"Demand for rennet/chymosin is projected to increase 1.6 percent per year to \$54 million in 2012, limited by relatively slow growth in US cheese production. Following a decade during which a strong trend toward the replacement of rennet with recombinant chymosin resulted in a market share of more than 75 percent for chymosin, recent consumer concerns regarding genetically modified food have prompted a pullback from recombinant chymosin by several manufacturers, including organic food suppliers. Nevertheless, chymosin is expected to ..."
 --Section v, pg. 222

OTHER STUDIES

Chemical Sensors

US demand for chemical sensors will grow 7.6% annually through 2012. Biosensors will continue to be the largest type, as the increasing number of diagnosed diabetics boosts demand for glucose test strips. Demand for chemical sensors based on emerging technologies, such as optical sensors, will see the fastest gains. This study analyzes the \$3.8 billion US chemical sensor industry, with forecasts for 2012 and 2017 by sensor type, analyte and market. It also evaluates market share and profiles 46 industry participants.

#2355 05/2008..... \$4500

Food & Beverage Additives

US food and beverage additive demand will rise 4.4% annually through 2012, driven by new and improved products. The flavored water, sports drink and energy drink markets will register robust growth. Additives in dairy products will benefit from increasing use of probiotic ingredients in yogurt and other products. This study analyzes the \$7 billion US food and beverage additive industry, with forecasts for 2012 and 2017 by product and application. It also evaluates market share and profiles major producers.

#2305 03/2008..... \$4500

World Biofuels

Global demand for biofuels will grow 20% annually through 2011, despite concerns about their impact on the environment and food supplies. Bioethanol and biodiesel will lead gains. North America will remain dominant while the Asia/Pacific region and Western Europe grow faster. This study analyzes the 37.7 million metric ton world biofuel industry, with demand and production forecasts for 2011 and 2016 by fuel, world region and for 16 countries. It also evaluates market share and profiles major players.

#2287 03/2008..... \$5500

Pulp & Paper Chemicals

US pulp and paper chemical demand will reach 19.8 million tons in 2011 based on rising paper and board production, the use of recycled paper and demand for brighter paper and board. Higher-priced specialty additives will lead gains due to their ability to lower pollution and production costs and improve quality. This study analyzes the \$7.7 billion US pulp and paper chemical industry, with forecasts for 2011 and 2016 by product type and end user. It also evaluates company market share and profiles major players.

#2293 02/2008..... \$4500

World Enzymes

World demand for enzymes will grow 7.6% annually through 2011. Gains will be driven by continued robust growth in pharmaceutical enzyme demand, double-digit increases in demand for biocatalysts for drug and fine chemical production, and the rapid expansion in bioethanol production from grains. This study analyzes the \$4.1 billion world enzyme industry, with forecasts for 2011 and 2016 by product, market, world region and for 15 countries. It also evaluates market share and profiles major players.

#2229 09/2007..... \$5400

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