

BIOTECHNOLOGY

by Emily Arakaki

Biotechnology and Diagnostics, Trade Development

Biotechnology — often defined as a collection of technologies and tools that use cellular and molecular processes to solve problems or make products — dominates research and development (R&D) in life sciences. The techniques associated with biotechnology — genetic engineering, monoclonal antibodies, DNA amplification, tissue engineering, stem cell regeneration, genomics, proteomics, and bioinformatics — continue to evolve with advances in scientific knowledge.

Application of biotechnologies has resulted in new medicines, safer vaccines, increased agricultural yields, and cleaner industrial processes. In the last 30 years, U.S. biotechnology enterprise has grown to encompass more than 1,300 companies that employ over 174,000 people. According to the Biotechnology Industry Organization, more than 250 million people worldwide have been helped by 133 biotechnology drugs and vaccines, tissue engineered products, and hundreds of new diagnostic tests. Of the biotech medicines on the market, 75 percent were approved in the last six years, and 350 more are in late stages of development. In agriculture, the first biotech-derived crops were commercialized in 1996 in the United States; by 2001, about 50 plant crop varieties had been approved for marketing. Over 88 million acres were planted with biotech-derived crops in the United States, providing more disease resistant crops and less reliance on conventional pesticides. Biotechnology is yielding diverse industrial products from biodegradable plastics to improved enzymes (that help conserve energy or reduce pollution).

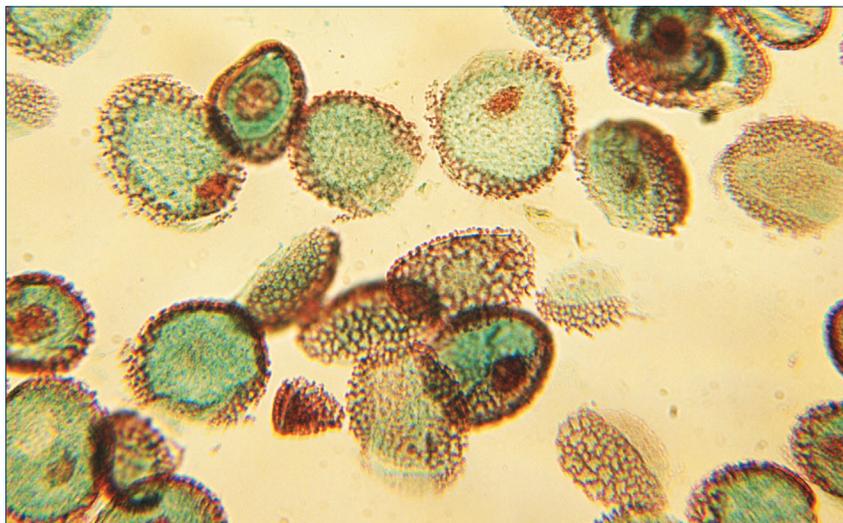
The aging of the baby boom generation and increasing population of elderly

persons will provide a tremendous market for biotech products, particularly for cancer and heart disease. Increased industry investment in R&D, as well as substantial increases in public funding by the National Institutes of Health and other agencies, will provide the ideas and working capital to commercialize new products. Many of the answers to bioterrorism will be found through the application of biotechnology into unraveling the genetic makeup of pathogens, design of safer vaccines, effective antidotes, and more reliable diagnostics.

While U.S. Census production and trade data on biotechnology are lacking, several private sources have been collecting data on U.S. companies engaged in biotech-related R&D and manufacturing. Precise figures are not available, but industry observers state that tremendous growth and opportunity lie ahead. Consulting Resources Corporation forecasts that U.S. sales will grow at 12 percent annually, reach-

ing \$62 billion within the next decade. Ernst & Young predicts that U.S. biotech revenues — about \$28 billion in 2001 — will grow by 15 to 20 percent annually for the next three to five years, and accelerate further as findings from genomics and proteomics are commercialized. Factors influencing market size include the pace of regulatory approvals, price/performance advantages (especially of non-medical products), and consumer acceptance of foods derived from biotech.

Most of the top-selling biotech products, biopharmaceuticals, are developed by U.S.-based companies and are often produced domestically or licensed for production abroad. Biotech companies also earn patent royalties and contract R&D payments. Industry sources estimate that about 40 percent of biotech-derived products and services are exported. The top export destinations are Western Europe, Japan, and Canada, paralleling exports of conventional biomedical products. ■



Pollen spores.