

The Impact of Biology: Biotech

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Editorial

Biotechnology is the use of biology to the solution of problems and the creation of valuable goods. The most common method is genetic engineering, which allows scientists to change the DNA of an organism at will. Biotechnology has applications in four key industrial areas: health care (medical), crop production and agriculture, non-food (industrial) uses of crops and other products (e.g. biodegradable plastics), and non-food (industrial) uses of crops and other products (e.g. biodegradable plastics).

In the early years, the main achievement of biotechnology was the ability to produce naturally occurring therapeutic molecules in larger quantities than could be derived from conventional sources such as plasma, animal organs, and human cadavers. Recombinant proteins are also less likely to be contaminated with pathogens or to provoke allergic reactions. Today, biotechnology researchers seek to discover the root molecular causes of disease and to intervene precisely at that level. Sometimes this means producing therapeutic proteins that augment the body's own supplies or that make up for genetic deficiencies, as in the first generation of biotech medications. (Gene therapy—insertion of genes encoding a needed protein into a patient's body or cells—is a related approach.) But the biotechnology industry has also expanded its research into the development of traditional pharmaceuticals and monoclonal antibodies that stop the progress of a disease. Such steps are uncovered through painstaking study of genes (genomics), the proteins that they encode (proteomics), and the larger biological pathways in which they act.

Agricultural applications of biotechnology have proved the most controversial. Some activists and consumer groups have called for bans on genetically modified organisms (GMOs) or for labeling laws to inform consumers of the growing presence of GMOs in the food supply. In the United States, the introduction of GMOs into agriculture began in 1993, when the FDA approved bovine somatotropin (BST), a growth hormone that boosts milk production in dairy cows. The next year, the FDA approved the first genetically modified whole food, a tomato engineered for a longer shelf life. Since then, regulatory approval in the United States, Europe, and elsewhere has been won by dozens of agricultural GMOs, including crops that produce their own pesticides and crops that survive the application of specific herbicides used to kill weeds. Studies by the United Nations, the U.S. National Academy of Sciences, the European Union, the American Medical Association, U.S. regulatory agencies, and other organizations have found GMO foods to be safe, but skeptics contend that it is still too early to judge the long-term health and ecological effects of such crops. In the late 20th and early 21st centuries, the land area planted in genetically modified crops increased dramatically, from 1.7 million hectares (4.2 million acres) in 1996 to 160 million hectares (395 million acres) by 2011.