Kirk-Othmer Encyclopedia of Chemical Technology.

BIOTECHNOLOGY

This article offers an overview of the coverage of biotechnology, ie, the use of biochemical and biological materials and processes, in the *Encyclopedia*. Biotechnology has long had a role in chemical technology, and information on the various processes and materials is well integrated in articles throughout the *Encyclopedia*.

In the early years of the chemical industry, use of biological agents centered on fermentation (qv) techniques for the production of food products, eg, vinegar (qv), cheeses (see Milk and milk products), beer (qv), and of simple organic compounds such as acetone (qv), ethanol (qv), and the butyl alcohols (qv). By the middle of the twentieth century, most simple organic chemicals were produced synthetically. Fermentation was used for food products and for more complex substances such as pharmaceuticals (qv) (see also Antibiotics). Moreover, supports were developed to immobilize enzymes for use in industrial processes such as the hydrolysis of starch (qv) (see Enzyme applications).

Advances in molecular biology and genetic engineering (qv) during the latter part of the twentieth century have widened the scope of possibilities for the use of biotechnological methods and resulted in increased interest on the part of the chemical industry. Microorganisms and mammalian cells are grown on an industrial scale (see Aeration, biotechnology; Cell culture technology) to be harvested for their chemical output (see Growth regulators; Hormones; Human growth factor; Insulin and other antidiabetic drugs; and Vaccine technology). Enzymes and microorganisms are utilized industrially to effect chemical modification of materials or to direct the outcome of synthetic reactions (see Enzyme applications in organic synthesis; Microbial transformations). Customized biological molecules are biologically produced to meet the needs of industry (see Enzyme inhibitors; Immunotherapeutic agents; Pharmaceuticals; Protein engineering). Biopolymers (qv), ie, carbohydrates (qv), enzymes, nucleic acids (qv), and proteins (qv), are used in clinical and chemical analyses both for detection (see Automated Instrumentation, clinical chemistry; Biosensors; Immunoassay; Medical diagnostic reagents) and for separation (see Biopolymers, analytical techniques; Chromatography) of materials.

The following is an alphabetized list of articles directly related to biotechnology in the *Encyclopedia*. However, even this list does not embrace all of the discussions of biochemical processing in the *Encyclopedia* because coverage of biotechnology is not limited to the highly specialized products and techniques of this subindustry. Designs appropriate to bioprocesses are also included in many of the unit operations articles (see Reactor technology; Separation, centrifugal; Sterilization; and Ultrafiltration. Also as new developments continually occur, materials articles will have appropriate up-to-date discussions of biotechnological methods.

Related Articles

Enzyme application; Milk and milk products; Antibiotics; Aeration, biotechnology; Cell culture technology; Growth regulators; Hormones, Human growth hormones; Insulin and other antidiabetic drugs; Vaccine technology; Enzyme applications in organic synthesis; Microbial transformations; Immunotherpaeutic agents; Pharmaceuticals; Protein engineering; Automated instrumentation, clinical chemistry; Biosensors; Immunoassay;

Aeration, Biotechnology	Fermentation
Automated instrumentation, Clinical chemistry	Genetic engineering, Procedures
Genetic engineering, Microbes	
Automated instrumentation, Hematology	Genetic engineering, Plants
Genetic engineering, Animals	
Biopolymers, Survey	Immunoassay
Biopolymers, Analytical techniques	Immunotherapeutic agents
Biosensors	Insulin and other antidiabetic drugs
Biotechnology	Medical diagnostic reagents
Cell culture technology	Microbial polysaccharides
Chromatography	Microbial transformations
Enzyme applications, Industrial	Nucleic acids
Enzyme applications, Therapeutic	Protein engineering
Enzyme applications in organic synthesis	Proteins
Vaccine technology	
Enzyme, inhibitors	Yeasts

Medical diagnostic reagents; Biopolymers, analytical techniques; Chromatography; Sterilization; Ultrafiltration