

What is Biotechnology?

Biotechnology is a technology that utilizes biological systems, living organisms or parts of this to develop or create different products.

History of Biotechnology

- People have been utilising biotechnology methods for thousands of years, although they did not call their profession biotechnology.
- In 1919, Hungarian engineer **Karl Ereky** used the term “**biotechnology**” to define a technology that involves turning raw materials into a more valuable product.
- Ancient Egyptians used fermenting techniques based on a knowledge of microbiological activities that occur in the absence of oxygen.
- Fermentation techniques were also used by Egyptians to make the dough rise during bread-making. More than 5050 types of bread were available in Egypt more than 4,0004,000 years ago.
- Egyptians also bred geese and cattle in the wetter areas of the Nile Valley to fulfil their society’s nutritional and dietary demands.
- Later studies revealed that yoghurt is created by the activity of yeast added to milk, which is likewise biotechnology because it employs a microbe for human benefit.
- People have utilised selective breeding to enhance crop and livestock production in order to feed themselves. Organisms with desired traits are mated to generate offspring with the same qualities in selective breeding.

Applications of Biotechnology

1. Biotechnology is currently employed in a variety of fields, including bioremediation, energy generation, and agricultural processing.
2. In forensic science, **DNA fingerprinting** is used.
3. **Insulin** manufacturing and other biotech-based medications are made by cloning vectors containing the desired gene.
4. Using genetic engineering, biotech offers a lot of potential in agriculture for producing insect- and disease-resistant plants.

5. Also used in the chemical sector as:
 - a. Fermentation is a method for making organic compounds.
 - b. High-purity chemical production.
 - c. Use of a low-energy method.

Scope and Importance of Biotechnology

A. Plant Biotechnology

1. Biotechnology boosts agricultural pest resistance, herbicide tolerance, and the adoption of more ecologically friendly farming techniques.
2. Creating crops with improved nutritional profiles to address vitamin and nutrient deficiency.
3. Producing allergen-free and toxin-free meals.
4. Increasing crop yields while reducing inputs.
5. Reducing the number of agricultural chemicals used by crops and limiting product run-off into the environment.
6. Using biotech crops that require fewer pesticide applications.
7. Viruses, bacteria, *Amoeba*, fungus, and other microbes are used to manage plant diseases and insect pests.

B. Medical Biotechnology

1. Biotechnology is assisting in the healing of the planet by utilising nature's toolbox and our own genetic composition.
2. Infectious illness rates are being reduced thanks to biotechnology.
3. Providing different therapies to reduce health risks and negative effects.
4. Developing more accurate disease detection techniques Combating severe diseases and other challenges that the poor world faces on a daily basis.
5. Improving the nutritional value of foods and agricultural oils in order to enhance cardiovascular health.
6. Human insulin, human and bovine growth hormone, human interferon and other important medicines have been synthesised.

7. DNA fingerprinting is used to identify parents and offenders.

C. Industrial Biotechnology

1. Improving the efficiency of the manufacturing process.
2. Reducing petrochemical consumption and dependence.
3. Biofuels are being used to reduce greenhouse gas emissions.
4. Reduced water use and trash creation.
5. Antibiotics such as **Penicillin, Erythromycin, Streptomycin, Mitomycin, Cycloheximide**, and others are manufactured.
6. Single cell proteins (SCP) derived from bacteria, yeast, fungus, or algae for human and animal use (as supplements).
7. Enzyme immobilisation for repetitive industrial use.

D. Animal Biotechnology

1. In vitro fertilization and embryo transfer are used to create test-tube babies in humans.
2. The output of transgenic animals for improved milk generation, growth rate, illness resistance, and the production of important proteins in milk, urine, and blood.
3. Superovulation and/or embryo splitting caused by hormones in farm animals; includes embryo transfer and, in many situations, in vitro fertilization.

E. Environmental Biotechnology

1. Deodorization of human excreta and efficient sewage treatment.
2. The process of breaking down contaminants in soil, air, or groundwater using organisms, generally bacteria.
3. Petroleum degradation and oil spill control.
4. Waste and industrial effluent detoxification.