

DEFINITION AND SCOPE OF BIOTECHNOLOGY

What is Biotechnology?

The literal meaning of Biotechnology as implied from this word is the study of tools from living things based on the split words contained therein i.e.

Bios - life

Teuchos - tool

Logos - Study of or essence

Definition of biotechnology

Biotechnology is any technique that uses living organisms or substances from these organisms to make or modify a product, to improve plants or animals or to develop microorganisms for specific uses (Grover et al., 2019)

Biotechnology is a multi-disciplinary concept involving many disciplines or branches of learning including all areas of life sciences such as Microbiology, Genetics, Molecular Biology, Biochemistry, Fermentation technology or Bio-process engineering and Bioinformatics etc.

It is the technology and processes in which raw materials are converted into products with the help of biological tools (OECD, 2001).

In summary; It can also be defined as the application of biological organisms, biological processes and biological processes to the production and service industries (Takaç, 2011).

Scope of Biotechnology

Biotechnology as explained above has the newest roots in the science of molecular biology, genetic engineering and microbiology. Advances in these areas have been exploited in a variety of ways both for production of industrially important bio-chemicals including enzymes and pharmaceutically important proteins, hormones etc. and for basic studies in molecular biology. As a result of its endless potentials, the scope and prospects of biotechnology have widened dramatically for commercial exploitation. By integrating

biotechnology in the process and product development at commercial scale, biotech based industries have grown enormously all over the World (Grover et al., 2019)

The origin of biotechnology, can be traced back to the first fermentation. All applications in the development of flour to bread, milk to cheese, yogurt are products of biotechnology and are as old as human history.

Ancient Biotechnology

- It began with early civilization,

- Production of wine, beer, and bread by using fermentation, (fermentation is the main factor)

- A natural process in which the biological activity of one-celled organisms play a critical role.

Classical Biotechnology

- It followed ancient biotechnology which makes wide spread use of methods from ancient biotechnology especially fermentation methods adapted to industrial production (enzyme, protein, antibiotic, carbohydrate etc..)

- It produces large quantities of food products and other materials in short time to meet demands of increasing population.

Modern Biotechnology

- It deals with manipulating genetic information.

- Microscopy and advanced computer technologies are used for in-depth knowledge of science.

- It is based on advancements in genetics research from the mid 1800s.

- In 1859, Darwin published his theory of evolution on the 'Origin of Species'.

- Use of biotechnology to produce new life forms emerged in mid 1900 's and it was made possible by rDNA technology.

- Many new techniques and products have been obtained in the fields of microbiology, biochemistry, medicine, biology, agriculture, environment, food (Verma et al., 2011).

We can name the processes of fermentation as traditional biotechnological processes, while we can call the biotechnological applications that have developed since the resolution of the secrets of the DNA helix as modern biotechnology.

In this context, biotechnological methods are the methods used to apply biological knowledge and techniques to product development, to use living organisms in product productions or process operation, or to use the living cell's genetic material to modify for new substances or new functions (Takaç, 2011).

Biotechnological applications are named as;

-Green biotechnology when used in agricultural applications,

-White biotechnology in industrial applications,

-Red biotechnology in the field of medicine,

-Blue biotechnology in aquaculture applications (Akkaya ve Pazarlıoğlu, 2012).

Historical Development (Timeline) of Biotechnology

The Babylonians and Sumerians used yeast to make beer in 6000 BC.

Brewing (fermentation of bread and yoghurt from milk) in 300 BC

Milk acid coagulation/fermentation by Pasteur in 1857

Discoveries of microbial milk acid (lactic acid) production in 1881.

Modified enzyme was started to be used in cheese production in the USA in 1990.

Cloned sheep were produced in Australia in 2000 (Bhatia ve Goli, 2018).

Biotechnological Production Process

Biotechnological processes are enzyme-catalyzed reactions and processes, and the catalytic reactions and processes of microbial, plant and animal tissue cells (Takaç, 2011). In the biotechnological production process, firstly, a substrate for the product is selected as a raw material as a result of analytical tests.

Biotechnological Products

They are substances produced by using microbial, plant and animal tissue cells or by biochemical pathways in which enzymes take place as biocatalysts. As an example of products obtained by biotechnological methods; Food products such as antibiotics, hormones, vitamins, vaccines, diagnostic kits, alcohols, organic acids, pharmaceutical proteins, amino acids, enzymes (industrial etc.), yeast, bread, cheese, yogurt, vinegar, pickles, wine, beer, animal vaccines and feeds, medicines for plants and disease pest control agents, as well as biopolymers and other biomaterials (Takaç, 2011).