

PHARMACEUTICAL BIOTECHNOLOGY

**TOPIC : Introduction to Biotechnology with reference to
Pharmaceutical Sciences.**



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INTRODUCTION

- ❑ Biotechnology is the broad area of biology, involving living systems and organisms to develop or make products, or "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use"
- ❑ Depending on the tools and applications, it often overlaps with the (related) fields of molecular biology, bio-engineering, biomedical engineering, biomanufacturing, molecular engineering, etc.
- ❑ The wide concept of "Biotech" or "biotechnology" encompasses a wide range of procedures for modifying living organisms according to human purposes, Modern usage also includes genetic engineering as well as cell and tissue culture technologies.

Historical Background

- ❑ BC 2,000 - Egyptians and Sumerians specialize in butter making and brewing.
- ❑ BC 300 - Greeks learn the method of grafting techniques for plant breeding.
- ❑ AD 100 - Chinese find the first pesticide from powdered chrysanthemum.
- ❑ 1663 - Robert Hooke's discovery of the cell.
- ❑ 1675 - Bacterial discovery of Anton van Leuwenhook.
- ❑ 1830 - Discovery of proteins.
- ❑ 1835 - Matthias Scheiden and Theodor Schwann publish the theory that all living things are made of tissue; Viichow declares that only one tissue can be made from one tissue.
- ❑ 1865 - John Gregor Mendel invents the Law of Heridity.

Historical Background

- ❑ 1870-1890 - Creation of several varieties of hybrid plants. Farmers start using nitrogenous bacteria.
- ❑ 1928 - Sir Alexander Fleming's discovery of penicillin antibiotic.
- ❑ 1953 - James Watson and Francis Crick first describe the double helix structure of DNA.
- ❑ 1968 - Marshall W. Nirenberg and Har Gobind Khurana receive the Nobel Prize for discovering genetic codes for generating 20 amino acids.
- ❑ 1970 - American microbiologist Daniel Nathans invents the first restriction enzyme. Restriction enzymes are useful for research purposes by helping to cut the genetic material that gives the genetic material.
- ❑ 1972 - DNA ligase first used to bind DNA fragments.

Historical Background

- ❑ 1973 - Stanley Cohen and Herbert Boyer invent the recombinant DNA technology. The event is considered to be a breakthrough for modern biotechnology.
- ❑ 1978 - Recombinant human insulin is first developed.
- ❑ 1980 - Paul Berg, Walter Gilbert and Fredrick Sanger were awarded the Nobel Prize in Chemistry for creating the first synthetic recombinant DNA molecule.
- ❑ 1981 - The first transgenic animal, the golden carp, is cloned by Chinese scientists.
- ❑ 1982 - Development of the first recombinant DNA vaccine for livestock. Kary Mullis invents the polymerase chain reaction (PCR), which enables the rapid amplification of small DNA fragments.

Historical Background

- ❑ 1983 - The world's first genetically modified plant was developed individually by four different research groups
- ❑ 1990 - World's First Human Genome Project begins.
- ❑ 1997 - Dolly - first mammal transcribed - born.
- ❑ 1998 - First 'model human genome' announcement defining the location of nearly 30,000 genes. (First Draft of Human Genome)
- ❑ 2000 - American scientists Craig Venter and Francis Collins announce to the world the first complete human genome.

Branches of Biotechnology

1.Blue Biotechnology

- ❑ Deals with marine organisms and water-borne organisms. Blue biotechnology is used to protect marine organisms from harmful diseases underwater.

2.Gold biotechnology(Bioinformatics)

- ❑ Bioinformatics is a combination of computers and biotechnology. It helps in finding the analysis of data related to Biotechnology.
- ❑ It is used for various purposes like drugs, for the development of medicines.
- ❑ Bioinformatics is known and referred by the term computational biology.
- ❑ It plays an important and vital role in areas like Functional genomics, structural genomics, and proteomics. These areas contribute a lot and become a key contributor to the Biotechnology and pharma sector.

Branches of Biotechnology

3.Green Biotechnology

- ❑ Green Biotechnology is the term used for the agricultural sector.
- ❑ Also, with the help of Transgenic plants (plants whose DNA is modified), this design of transgenic plants helps to grow in a specified environment with the help of certain chemicals.

4.Red biotechnology

- ❑ Red biotechnology is referred to as Medical Biotechnology. It is used for the production of drugs and antibiotic medicines.

Inter-discipline of Red biotechnology

- ❑ Pharmaceutical biotechnology- principles of biotechnology, applied for the development of drugs.

Branches of Biotechnology

5. White Biotechnology

- ❑ White Biotechnology is also called and known by the name Industry Biotechnology.
- ❑ This kind of biotechnology is used and applied in industries

6. Yellow biotechnology

- ❑ It refers to the use of biotechnology in food production, for example in making wine, cheese, and beer by fermentation.
- ❑ It has also been used to refer to biotechnology applied to insects.

7. Gray biotechnology

- ❑ Deals with environmental applications, and focused on the maintenance of biodiversity and the removal of pollutants.

Branches of Biotechnology

8. Brown biotechnology

- ❑ It related to the management of arid lands and deserts. One application is the creation of enhanced seeds that resist extreme environmental conditions of arid regions, which is related to the innovation, creation of agriculture techniques and management of resources.

9. Violet biotechnology

- ❑ It is related to law, ethical and philosophical issues around biotechnology

10. Dark biotechnology

- ❑ It is associated with bioterrorism or biological weapons and biowarfare which uses microorganisms, and toxins to cause diseases and death in humans, livestock and crops

Pharmaceutical Biotechnology

- ❑ Pharmaceutical biotechnology is a relatively novel and advancing field in which the principles of biotechnology are applied for the development of drugs.
- ❑ Thus, biotechnology products broadly refer to biopharmaceutical drugs generated through researches in cell biology, genetics and recombinant DNA technology.

Aim

- ❖ The aim of this pharmaceutical biotechnology is to design, produce drugs that are adapted to each person's genetic make up, which can give the maximum therapeutic effect.
- ❖ Biotechnology plays an important role in pharmaceutical science most especially in the pharmaceutical industries by creation of genetically modified organisms that can be used in industrial production.

ADVANTAGES

- ❑ When the two disciplines- pharmaceuticals and biotechnology- come together, they result in many advantages for humankind in terms of healthcare.
- ❑ This is possible through Pharmacogenomics (derived from 'pharmacology' and 'genomics') which refers to the study of how the genetic inheritance affects individual human body's response to drugs.
- ❑ Biopharmaceutical drugs aim at designing and producing drugs that are adapted to each person's genetic makeup.
- ❑ Thus pharmaceutical biotechnology developed to tailor-made medicines for maximum therapeutic effects.

ADVANTAGES

- ❑ Recombinant DNA (rDNA) and monoclonal antibody (MAb) are providing exciting opportunities for new pharmaceuticals development as well as new approaches to drug delivery.
- ❑ Recombinant DNA technology, which entails genetic manipulation of cells, or a monoclonal antibody for making biotechnological products.
- ❑ These biotechnological-pharmaceutical products are widely used in prevention, diagnosis or treatment of many types of diseases.
- ❑ Biotech companies design and produce safer vaccines by organisms that are transformed through genetic engineering. These biotech vaccines minimize the risks of infection.

Applications of P'Ceutical Biotechnology

Production of Pharmaceutical biotechnology products

The common pharmaceutical biotechnology products includes, Antibodies, Proteins, and Recombinant DNA Products.

Recombinant DNA Products.

- Recombinant DNA Vaccines
- Recombinant DNA Drugs
- Recombinant DNA Enzymes
- Recombinant DNA Growth Hormone
- Recombinant DNA Insulin
- Recombinant DNA Proteins
- Recombinant DNA Yeast

Applications of P'Ceutical Biotechnology

Production of some Biopharmaceuticals

1. Somatostatin
2. interferon's
3. Lymphokines
4. Growth factors
5. albumin
6. clotting factors
7. Enzymes
8. vaccines
9. Nucleic acid products
10. Genitically modified somatic cells

Therapeutic uses of P'Ceutical Biotechnological products

- Detection of Genetic Diseases
- Gene Therapy
- Pre-natal Diagnosis of Inherited Diseases
- Tissue Regeneration (i.e) Skin Grafting
- Fertility Control
- Genetic Counseling
- Pre-implantation Genetic Diagnosis
- Cancer therapy
- AIDS and AIDS-related and autoimmune diseases
- In diagnostic investigations

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THANK YOU !