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PHARMACEUTICAL BIOTECHNOLOGY



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INTRODUCTION

- **PHARMACEUTICAL BIOTECHNOLOGY** consist of the combination of two branches which Are “**PHARMACEUTICAL SCIENCE**” AND “**BIOTECHNOLOGY**”.

DEFINATION:

- **PHARMACEUTICAL SCIENCE:** Can simply be define as the branch of science that deals with the formulation, compounding and dispensing of drugs
- **BIOTECHNOLOGY:** Can simply be define as the application of biological system, living organisms, or their derivatives in making or modifying products or processes for specific use.



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Key Words

- **Protein**
 - A **protein** is a naturally occurring, extremely complex substance that consists of amino acid residues joined by peptide bonds. **Proteins** are present in all living organisms and include many essential biological compounds such as enzymes, hormones, and antibodies.
- **Enzymes**
 - An **enzyme** is a substance that acts as a catalyst in living organisms, regulating the rate at which chemical reactions proceed without itself being altered in the process. Without **enzymes**, many of these reactions would not take place at a perceptible rate. **Enzymes** catalyze all aspects of cell metabolism.
- **Antigen**
 - An **antigen** is any substance that causes your immune system to produce **antibodies** against it. This means your immune system does not recognize the substance, and is trying to fight it off.
An **antigen** may be a substance from the environment, such as chemicals, bacteria, viruses, or pollen.



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- **Antibodies**
- An **antibody** is a protein produced by the body's immune system when it detects harmful substances, called antigens. Examples of antigens include microorganisms (bacteria, fungi, parasites, and viruses) and chemicals. ... Each type of **antibody** is unique and defends the body against one specific type of antigen.
- **Monoclonal Antibodies**
- A type of protein made in the laboratory that can bind to substances in the body, including cancer cells. There are many kinds of **monoclonal antibodies**. A **monoclonal antibody** is made so that it binds to only one substance. **Monoclonal antibodies** are being used to treat some types of cancer.
- **Recombinant DNA**
- **Recombinant DNA** (rDNA) is a technology that uses enzymes to cut and paste together **DNA** sequences of interest. The recombined **DNA** sequences can be placed into vehicles called vectors that ferry the **DNA** into a suitable host cell where it can be copied or expressed.



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- **Vector**

- A **vector** is any vehicle, often a virus or a plasmid that is used to ferry a desired DNA sequence into a host cell as part of a molecular cloning procedure.

- **Vaccine**

- **Vaccines by definition** are **biological** agents that elicit an immune response to a specific antigen derived from an infectious disease-causing pathogen.

- **Plasmid**

- A **plasmid** is a small, circular, double-stranded DNA molecule that is distinct from a cell's chromosomal DNA. **Plasmids** naturally exist in bacterial cells, and they also occur in some eukaryotes. Often, the genes carried in **plasmids** provide bacteria with genetic advantages, such as antibiotic resistance.



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PHARMACEUTICAL BIOTECHNOLOGY

- Can simply be define as the science that covers all technologies required for the production, manufacturing and registration of biological drugs.
- The aim of this pharmaceutical biotechnology is to design, produce drugs that are adapted to each persons 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.



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COMMON PHARMACEUTICAL BIOTECHNOLOGICAL PRODUCT

The common pharmaceutical biotechnology products that are made by the biotech pharmaceutical companies includes:

- ***Antibodies**
- ***Proteins**
- ***Recombinant DNA Products.**



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ANTIBODIES

Antibodies are proteins that are produced by white blood cells and are used by the immune system to identify bacteria, viruses, and other foreign substances and to fight them off.

In the recent years, monoclonal antibodies are one of the most exciting developments in biotechnology pharmaceuticals.

Example:

Actin in Alpha monoclonal Antibodies, Actin smooth muscle monoclonal antibodies etc.



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PROTIENS

Proteins: Proteins made of amino acids are large, complex molecules that do most of the work in cells and are required for the structure, function, and regulation of the body's tissues and organs.

Protein biotechnology is emerging as one of the key technologies of the future for understanding the development of many diseases like cancer or amyloid formation for better therapeutic intervention.



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RECOMBINANT DNA PRODUCT

- Recombinant Deoxyribonucleic Acid is the genetically engineered DNA created by recombining fragments of DNA from different organisms. Some of the Recombinant DNA Products includes:
 - ***Recombinant DNA Vaccines**
 - ***Recombinant DNA Drugs**
 - ***Recombinant DNA Enzymes**
 - ***Recombinant DNA Growth Hormone**
 - ***Recombinant DNA Insulin**
 - ***Recombinant DNA Proteins**
 - ***Recombinant DNA Yeast**



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RECOMBINANT DNA VACCINE

- A recombinant vaccine is a vaccine produced through recombinant DNA technology. This involves inserting the DNA encoding an antigen (such as a bacterial surface protein) that stimulates an immune response into bacterial or mammalian cells, expressing the antigen in these cells and then purifying it from them.
- **Example:** Hepatitis B infection is controlled through the use of a recombinant hepatitis B vaccine



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RECOMBINANT DNA DRUGS

NAME OF DRUG	WHAT HUMAN PROTEIN IS FORMULATED AS THE DRUG	PHARMACODYNAMICS OF THE DRUG
1. <u>Humulin</u> <u>Chart comparing Time Activity Profiles (go here)</u>	rInsulin [FDA approval 1982]	Diabetes: Used by over 3.5 million people in the U.S. every day
2. <u>Humatrope</u>	rHuman growth hormone (hGH) (Somatropin) [FDA approval 8/96]	For Somatropin Deficiency Syndrome (SDS) in adults and GHD in children
4. <u>Forteo</u>	rParathyroid hormone, [FDA Approval Nov 26, 2002]	Treatment of osteoporosis in women and men



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RECOMBINANT DNA PRODUCTS

R-DNA PRODUCT	EXAMPLE	FUNTION
R-DNA ENZYME	CHYMOSINE	Essential to Nmanufact cheeses
R-DNA GROWTH HORMONE	PROTROPIN	Support gr developme
R-DNA INSULIN	HUMULIN	For the tre insulin- dependent



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THANK YOU



Happy to Answer if you have any question.....