**GREEN GRACE IGBOGI**

**18/MHS07/021**

**PHARMACOLOGY**

**PHA 210 ASSIGNMENT**

**QUESTION**

**Discuss in details the aspects of medical biotechnology.**

**MEDICAL BIOTECHNOLOGY.**

Biotechnology is the manipulation of living organisms and organic materials to serve human needs for the use of humans. It’s the use of living things such as cells, enzymes, bacteria, molecules for the production of various products for the benefit or use of humans. With all this been said Medical biotechnology is the use if living organisms in technological applications to save human lives.

Biotechnology is commonly used to improve medicines due to the advantages and pieces of knowledge it provides such as understanding the genetic composition of the human species, foundational structure of hereditary diseases manipulation and repairing of damaged genes to cure diseases.

**ASPECTS OF MEDICAL BIOTECHNOLOGY**

There are numerous methods applied to biotechnology such as gene treatment, recombinant DNA technology,  [polymerase chain reaction](https://www.sciencedirect.com/topics/medicine-and-dentistry/polymerase-chain-reaction), gene sequencing, [fluorescence in situ hybridization](https://www.sciencedirect.com/topics/medicine-and-dentistry/fluorescence-in-situ-hybridization), microarrays, cell culture, gene silencing using interference RNA, and [genome editing](https://www.sciencedirect.com/topics/medicine-and-dentistry/genome-editing), have significantly contributed towards improving health science, such as the sequencing of the human genome, use of stem cells for [regenerative medicine](https://www.sciencedirect.com/topics/medicine-and-dentistry/regenerative-medicine), tissue engineering, development of antibiotics, and the generation of [monoclonal antibodies](https://www.sciencedirect.com/topics/medicine-and-dentistry/monoclonal-antibody) for therapy.

A more targeted approach is called polymerase establishment revenge which uses genetics along with DNA particles to make a projected illness and put in replace them with healthy genes in the physical body in place of the harmed cells.

1. **Gene Treatment**

Gene Treatment can only come in place when there is any form of gene disorder that can be done by:

* Replacing the abnormal gene with a normal gene,
* Repairing the abnormal gene,
* Altering how that gene is controlled,
* Get other cells to take over function of abnormal cells,
* Inserting correct protein and bypass gene function.

Gene therapy is the insertion of genes into an individual's cells and tissues to treat a disease, and hereditary diseases in which a defective mutant allele is replaced with a functional one. Although the technology is still in its infancy, it has been used with some success.

1. **Genetic Engineering**

Genetic engineering, also called genetic modification, is the direct manipulation of an organisms genome using biotechnology. It is a set of technologies used to change the genetic makeup of cells, including the transfer of genes within and across species boundaries to produce improved or novel organisms. It is a set of [technologies](https://en.m.wikipedia.org/wiki/Genetic_engineering_techniques) used to change the genetic makeup of cells, including the transfer of genes within and across species boundaries to produce improved or novel [organisms](https://en.m.wikipedia.org/wiki/Organisms). New [DNA](https://en.m.wikipedia.org/wiki/DNA) is obtained by either isolating and copying the genetic material of interest using [recombinant DNA](https://en.m.wikipedia.org/wiki/Recombinant_DNA) methods or by [artificially synthesising](https://en.m.wikipedia.org/wiki/Artificial_gene_synthesis) the DNA. A [construct](https://en.m.wikipedia.org/wiki/Vector_(molecular_biology)) is usually created and used to insert this DNA into the host organism. The first recombinant DNA molecule was made by [Paul Berg](https://en.m.wikipedia.org/wiki/Paul_Berg) in 1972 by combining DNA from the monkey virus [SV40](https://en.m.wikipedia.org/wiki/SV40) with the [lambda virus](https://en.m.wikipedia.org/wiki/Lambda_phage). As well as inserting [genes](https://en.m.wikipedia.org/wiki/Gene), the process can be used to remove, or "[knock out](https://en.m.wikipedia.org/wiki/Gene_knockout)", genes. The new DNA can be inserted randomly, or [targeted](https://en.m.wikipedia.org/wiki/Gene_targeting) to a specific part of the [genome](https://en.m.wikipedia.org/wiki/Genome).

1. **Recombinant DNA Technology**

**Recombinant DNA**, [molecules](https://www.britannica.com/science/molecule) of [DNA](https://www.britannica.com/science/DNA) from two different [species](https://www.britannica.com/science/species-taxon) that are inserted into a host organism to produce new genetic combinations that are of value to [science](https://www.britannica.com/science/science), [medicine](https://www.britannica.com/science/medicine), agriculture, and industry. Since the focus of all [genetics](https://www.britannica.com/science/genetics) is the [gene](https://www.britannica.com/science/gene), the fundamental goal of laboratory geneticists is to isolate, characterize, and manipulate genes. Although it is relatively easy to isolate a sample of DNA from a collection of [cells](https://www.britannica.com/science/cell-biology), finding a specific gene within this DNA sample can be compared to finding a needle in a haystack. Consider the fact that each human cell contains approximately 2 metres (6 feet) of DNA. Therefore, a small tissue sample will contain many kilometres of DNA. However, recombinant DNA [technology](https://www.britannica.com/technology/technology) has made it possible to isolate one gene or any other segment of DNA, enabling researchers to determine its [nucleotide](https://www.britannica.com/science/nucleotide) sequence, study its transcripts, mutate it in highly specific ways, and reinsert the modified sequence into a living organism.

1. **Cell Culture**

Cell culture is the process by which [cells](https://en.m.wikipedia.org/wiki/Cell_(biology)) are grown under controlled conditions, generally outside their natural environment. After the cells of interest have been [isolated from living tissue](https://en.m.wikipedia.org/wiki/Cell_isolation), they can subsequently be maintained under carefully controlled conditions. These conditions vary for each cell type, but generally consist of a suitable vessel with a substrate or medium that supplies the essential nutrients ([amino acids](https://en.m.wikipedia.org/wiki/Amino_acid), [carbohydrates](https://en.m.wikipedia.org/wiki/Carbohydrate), [vitamins](https://en.m.wikipedia.org/wiki/Vitamin), [minerals](https://en.m.wikipedia.org/wiki/Mineral)), [growth factors](https://en.m.wikipedia.org/wiki/Growth_factor), [hormones](https://en.m.wikipedia.org/wiki/Hormone), and gases ([CO2](https://en.m.wikipedia.org/wiki/Carbon_dioxide), [O2](https://en.m.wikipedia.org/wiki/Oxygen)), and regulates the physio-chemical environment ([pH buffer](https://en.m.wikipedia.org/wiki/Buffer_solution), [osmotic pressure](https://en.m.wikipedia.org/wiki/Osmotic_pressure), [temperature](https://en.m.wikipedia.org/wiki/Temperature)). Most cells require a surface or an artificial substrate (adherent or monolayer culture) whereas others can be grown free floating in culture medium ([suspension culture](https://en.m.wikipedia.org/wiki/Suspension_culture)). The lifespan of most cells is genetically determined, but some cell culturing cells have been “transformed” into immortal cells which will reproduce indefinitely if the optimal conditions are provided.

1. **Genome Editing**

Genome editing is a technique used to precisely and efficiently modify DNA  within a [cell](javascript:void(%22Click%20to%20expand%20this%20glossary%20term%22)). Genome editing is a way of making specific changes to the DNA of a cell or organism. An enzyme cuts the DNA at a specific sequence, and when this is repaired by the cell a change or ‘edit’ is made to the sequence. It involves making cuts at specific DNA sequencing with enzymes called ‘engineered nucleases’ Genome editing can be used to add, remove, or alter DNA in the genome. By editing the genome the characteristics of a cell or an organism can be changed.

It is the process of determining the complete DNA sequence of an organism’s genome at a single time. This entails sequencing all of an organism chromosomal DNA as well as DNA contained in the mitochondria. In practice genome sequence that are nearly complete are called whole genome sequences. Whole genome sequencing has largely been used as a research tool. In the future of personalised medicine, whole genome sequence data may be an important tool to guide therapeutic interventions.

1. **Tissue engineering**

It involves the creation of human tissue outside the body for later use. Tissue engineering have created bone marrow, artificial skin and cartilages.

1. **Stem cells**:

Stem cell is a cell that has the potential to develop into any cell type in the human body. Usually, stem cells are introduced into the damaged areas of the body under the right conditions, it will be replacing the damaged area. More often, these stem cells are grown in the lab, first to ensure the proper condition and after that, it is inserted into the sick person. The richest sources of stem cell is form the embryo. The main area where the stem cells have proven their worth is in bone marrow transplants. Replacing damaged heart tissue after nerve tissue for those having spinal cord injury. Stem cells are currently used for the treatment of diseases right from Crohn’s disease to baldness.

**Advantages of medical biotechnology**

* It is used to improve medicine due to the advantages and pieces of knowledge it provides such as understanding the genetics composition of the human species, foundational structure of hereditary disease manipulation and repairing of damaged genes to cure diseases.
* Bio-engineers create health technologies and value adding outcome that have made considerable upgrade in curing illness and diseases along with providing a better quality of life for patients.
* Biotechnology has made break through to treat diseases that are said to be incurable.
* It has helped in the detection of cancer cells by using the patient’s spit and subjecting it to special sensors that detect the presence of cancerous cells.
* Biotechnology has helped in the production of drugs that improve patients health by introducing protein and enzymes to the body while reducing the risk of damage to healthy cells.

**Disadvantage of medical biotechnology**

1. Biotechnology helps in the production of antibiotic resistant bacteria.
2. Human beings alter animals, plants and even microbes through selective breeding for the benefit of the society.
3. Biopharmaceutical drugs are more expensive than traditional drugs.
4. Genetic engineering uses viral vectors to carry functional genes into the human body, the consequences of these viral gene on the human body is unknown. The functional genes may replace an important gene instead of the mutated gene. This may lead to other forms of diseases or health conditions in human. That may lead to extinction of human population from the earth.