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COURSE TITLE: INTRODUCTION TO BIOTECHNOLOGY

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ASSIGNMENT: DISCUSS IN DETAIL THE ASPECT OF MEDICAL

BIOTECHNOLOGY.

MEDICAL BIOTECHNOLOGY

Medical biotechnology is a combination of different science oriented subject namely cell biology, genetic, nanotechnology, bio-information etc to carry out advancements in the field of medicine. It makes use of recombinant DNA technology in different therapeutic form. Medical biotechnology is the use of living cells and cell materials to research and produce pharmaceutical and diagnostic products that help treat and prevent human disease. Biotechnology is used to improve medicines due to the advantages and pieces of knowledge it provides such as understanding the genetic composition of the human species, foundation structure of hereditary disease manipulation and repairing of damaged gene to cure disease. In medical biotechnology, one learns how disease affect the human body at the cellular level, It's aim is the prevention or the treatment of the disorder, thereby increasing the lifespan of an individual. Medical biotechnology is also called red biotechnology because of it's application in the manufacturing of pharmaceuticals like vaccine, enzymes, antibiotics etc.

APPLICATIONS OF MEDICAL BIOTECHNOLOGY

Application of medical biotechnology includes;

- Pharmacology
- Gene therapy
- Stem cells
- Tissue engineering
- Monoclonal antibodies
- Bio-processing
- Genome sequencing
- In-vitro fertilization

Pharmacology: Pharmacology includes the principles of biotechnology for the development of drugs like nucleic acid products, antibodies and vaccines.

Gene therapy: It involves the use of DNA as a pharmaceutical agent to treat a particular disease. It requires replacing a mutated gene with a therapeutic gene. Gene therapy has made significant advances over the past two decades, within a short duration, it has transformed from a theoretical stage to a technological phase as well as clinical trials against a variety of deadly disease. The most notable advancement included gene therapy for many genetic disorder like severe combined immunodeficiency, chronic granulomatous disorder, hemophiles, cancer, parkinson's disease, influenza, HIV and many more acquired disease.

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.

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.

Monoclonal antibodies: These are clones of an individual parent cell. Antibodies are the proteins that attack invading pathogens. It is a vital tool for finding small molecules in biological samples.

Step involved in making monoclonal antibodies are;

- Human antibody producing genes are inserted into the mouse.
- The mouse is infected, making it produce antibody producing cells, i.e B-cells.
- These cells are removed from the mouse and fused with a tumor cell.
- Now we have tumor cell consistently producing antibodies and many cells like it. The advantages of this monoclonal antibody is that they are trained to target markers that show up cancer features and keeps on destroying them. There are many protein therapeutics developed so far, these includes insulin for diabetes, somatotropin and somatostatin for growth disorders, erythropoietin for anaemia, tumor necrosis factor for cancer, interferons for controlling viral infections, lymphokines like interleukin -2 which has the ability to restore the immune system to fight against cancer, certain infections and some disease etc.

Bio-processing: It is one of the areas in charge of research where in mass production of human protein, vaccines etc are made by genetically modifying bacteria and viruses. This leads to the production of large quantities of the desired product within a short period of time with relatively less expenditure. One of the significant application of bio-processing is insulin. Insulin is the human protein which is responsible for reducing blood sugar level after the intake of food. They did this by replacing the human gene for insulin in bacteria. It is cultured and allowed to produce insulin which is collected, purified and sold to diabetes worldwide.

Genome sequencing: 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.

In-vitro fertilization: In-vitro fertilization (IVF) is a complex series of procedure used to treat fertility or genetic problems and assist with the conception of a child during IVF, mature eggs are collected from ovaries and fertilised by sperm in the laboratory. In in-vitro fertilization, eggs and sperm are brought together in a laboratory glass dish to allow the sperm to fertilize an egg. After IVF, one or more fertilized eggs are placed in the uterus. It is the best chance for couples struggling with infertility. It can give you more than one child at a time from the many fertilized eggs implanted.

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.
- It helps in enhancing host resistance to infections disease and eliminating genetic based diseases.
- It is essential in the production of improved animal medicinal

products and diagnostic tools.

- Biotechnological products help in elongating the life span of humans.
- Biotechnological knowledge provides protection against viruses for the well being of humans.

Disadvantage of medical biotechnology

- Biotechnology helps in the production of antibiotic resistant bacteria.
- Human beings alter animals, plants and even microbes through selective breeding for the benefit of the society.
- Biopharmaceutical drugs are more expensive than traditional drugs.
- Genetic engineering uses viral vectors to carry functional genes into the human body, the consequences of these viral genes 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.