



MICROBIOLOGY



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Proteins are essential nutrients for human body. Proteins are nitrogenous organic compound that consist of large molecules composed of one or more long chain of amino acid and an essential part of all living organisms.

In human body every cell contains proteins. Proteins is a chain of amino acids. We need proteins in our diet. It helps the body to repair cells and make new ones.

- Proteins are important for body building, growth, repair and maintenance of the body tissues.
- They are required for the synthesis of plasma proteins, hemoglobin, enzymes and hormones.
- Protein is also important for the growth and development in children, teens, and pregnant women.

Now we will learn about how proteins are synthesized in our body. But before we will learn about some important definitions.

Cell: Mysterious automatic machine that is capable of evolving.

Translation: Translation is the process of translating the sequence of a messenger RNA (mRNA) molecule to a sequence of amino acids during protein synthesis.

Transcription: Transcription is a process in a particular segment of DNA is copied into RNA by the enzyme RNA polymerase.

Replication: Replication is the process of duplication or producing an exact copy of a polynucleotide strand such as DNA.

Role of DNA, RNA and Ribosome in Protein synthesis:

1. The synthesis of protein start with transcribing the instruction in DNA into mRNA.
2. The mRNA is then carried out of the cell's nucleus into the cytoplasm, specifically into structures called ribosome.
3. Protein production occurs in ribosomes containing rRNA.
4. The tRNA transports the amino acids to the ribosomes.
5. The code sequence in mRNA is then translated and specific proteins are synthesized by stringing amino acids together.
6. The production or synthesis of polypeptide chains (Proteins) includes two phase:
 - Transcription
 - Translation

DNA → RNA → mRNA → Protein

Transcription

Translation

Why Protein is essential in living organism or write down the function of Protein.

Any class of nitrogenous organic compounds that consist of large molecules and composed of one or more long chains of amino acids are essential part of all living organisms, especially as structural components of body tissues such as hair, muscle, collagen etc. and as enzymes and antibodies.

Protein is essential in living organism because it contains many things. Such as-

1. Structure & mechanics (Troponin)
2. Enzymes (Trypsin, Pepsin)
3. Hormones (Insulin, Gastrin)
4. Signaling molecules (Anexine)
5. Antibodies (Immunoglobulins: IgG, IgM etc.)
6. Fluid balance (Albumin)
7. Acid-base balance (Plasma protein)
8. Channels (Voltage gated ion channels, Ligand gated ion channels)
9. Pump (Na ion, K ion)
10. Receptors (GPCR)
11. Transport function (Hemoglobin)

What are the essential characteristics of life?

Biologists have formulated a list of characteristics by which we can recognize living things. The seven characteristics of life include:

1. Responsiveness to the environment.
2. Growth and change/adaptation.
3. Ability to reproduce.
4. Have a metabolism and breathe.
5. Maintain homeostasis.
6. Being made of cells.
7. Passing traits onto offspring.

Each single cell in our body is individually alive. They work together like human works in a society. They change (improve) over time like our surrounding does.

Bacteria: Bacteria are microscopic, single-celled organism that thrive in diverse environment. Bacteria live in a variety of environments, from hot water to ice. Some bacteria are good for you, whether others can make you sick.

Example: Bacillus, Coccus

Write down the positive & negative side of bacteria.

Positive side	Negative side
1. Biotechnology: Production of the biotech products.	1. There are some harmful bacteria. E.coli can be either good or harmful bacteria.
2. There are some useful bacteria in our gut.	2. E.coli can be pathogenic, leading to diarrhea, respiratory illness, urinary tract infection and other illness.
3. To producing vaccine	3. Diseases caused by bacteria: <ul style="list-style-type: none"> • Pneumonia • Tuberculosis • Cholera

Virus: Virus is an infective agent that typically consists of a nucleic acid molecule in a protein coat. It is too small to be seen by light microscopy.

Example: Adeno, Retro etc.

Write down the positive & negative side of virus

Positive side	Negative side
1. To producing vaccine	1. Virus can kill many cells.
2. Use in gene therapy and use to treat cancer.	2. Diseases caused by virus are- <ul style="list-style-type: none"> • Flu • Dengue • AIDS • NIPA

Fungus: A fungus is any membrane of the group of eukaryotic organisms that includes microorganisms such as yeasts and molds, as well as the more familiar mushrooms.

Diseases caused by fungus:

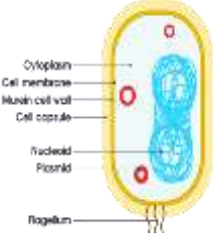
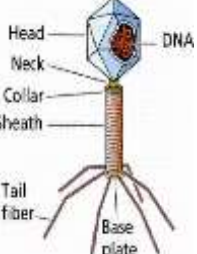

- Candidiasis
- Histoplasmosis
- Blastomycosis

Uses of fungus:

- Producing antibiotics
- As a food
- Kill insects
- As Model Research Organism

Difference between bacteria, virus & fungus.

Type	Bacteria	Virus	Fungus
Size	0.5-5.0 μ m	Diameter: 20-300 nm Length: 20-1500 nm	Diameter: 2-10 μ m Length: 3-4 μ m
Motility	Prokaryotic cells use a flagellum to move.	They transported through air.	Don't move.
Genetics	DNA	DNA/RNA	DNA
Cell wall	Prokaryotic cell walls are constructed from peptidoglycan.	Virus don't have cell wall.	Fungal cell walls are mainly built from chitin.
Nutrition	Bacteria take up nutrients to survive, grow & reproduce.	They don't take up nutrients.	Fungi usually take up mono-saccharides, di saccharides, amino acids to grow.
Nucleus	Prokaryotic cell don't have a nucleus.	Virus don't have a nucleus.	Fungi contain a nucleus.
Is the organism alive?	Yes	No	Yes
Agents against bacteria, virus & fungi	<ol style="list-style-type: none"> 1. Beta-lactam antibiotics 2. Sulfonamide antibiotics 3. Quinolone antibiotics 	Virus are fought off with the help of antiviral drug.	<ol style="list-style-type: none"> 1. Polyene antifungals 2. Azole antifungals 3. Echinocandine antifungals
Most common name	<ol style="list-style-type: none"> 1. Spirochete 2. Coccus 3. Bacillus 	<ol style="list-style-type: none"> 1. Polyhedral 2. Spherical 3. Phage 	<ol style="list-style-type: none"> 1. Hypha 2. Yeasts

Diseases	<ol style="list-style-type: none"> 1. Cholera 2. Diphtheria 3. Anthrax 4. Pneumonia 5. Lyme disease 	<ol style="list-style-type: none"> 1. Chickenpox 2. Colds 3. Dengue 4. Flu 5. Ebola fever 	<ol style="list-style-type: none"> 1. Aspergillosis 2. Blastomycosis 3. Candidiasis 4. Fungal meningitis 5. Ringworm
Structure	 <p>Labels for the bacterium diagram:</p> <ul style="list-style-type: none"> Cytoplasm Cell membrane Mucous cell wall Cell capsule Nucleoid Plasmid Flagellum 	 <p>Labels for the bacteriophage diagram:</p> <ul style="list-style-type: none"> Head Neck Collar Sheath Tail fiber Base plate DNA 	 <p>Labels for the mushroom diagram:</p> <ul style="list-style-type: none"> Cap Gills Stalk Mycelium