BIOTECHNO ACTIVITY BOOK

Compiled by :

EDUHEAL FOUNDATION

• LEARNING FOR LIFE •

EDUHEAL FOUNDATION
• LEARNING FOR LIFE •
103, Taj Apartment, Ground Floor, Ring Road, Near Safdarjung Hospital, New Delhi - 29.
Ph: 011-26161014, website : www.eduhealfoundation.org, e-mail : info@eduhealfoundation.org

Preface

Biotechno Activities book is a small step torwards encouraging school students to take up biotechnology. We at EduHeal Foundation still need lot of help and encouragement from school teachers and Principal in accomplishment of our goal. It is you who form the vital link between EduHeal Foundation and students as you can further encourage students to know about biotechnology on a day to day basics. We would also not sit idle but make efforts to increase interest :

- By publishing books like Biotechno Activities Books.
- Create awareness by conducting Nationwide Biotechnology Olympiad.
- Teacher Tranining Programme in basics of genetics and Biotechnology.
- Career Development Workshop for Students.
- Virtual Genetic Lab.
- Networking to enhance school/Govt./ Industry Interface.

EDUHEAL FOUNDATION wishes to thank the following for their support

* **EduSys Subject Experts**
* **Mr. Ram Mohan Rao**
  Former Principal Information officer, Govt, Of India
  Information Advisor to the Prime Minister
* **Prof. S.S. Mathur**
  Former Prof. & Head, Centre for Energy Studies, IIT Delhi, Institutional Co-ordinator, United Nations Unversity, Tokyo, Japan
  Minister, Education & Culture, Embassy of India, Washington DC, USA
* **Mr Ranglal Jamuda, IAS**
  Commissioner
  Kendriya Vidyalaya Sangathan, New Delhi
* **Mr. Pervez Ali Khan**
  NISCAIR, New Delhi
* **Dr. K. Sharma, Dept. of Biotechnology, AIIMS, Delhi**
* **Dr. Saroj Mishra**
  Prof. of Biotechnology, IIT, Delhi
* **Dr. A.N. Sinha, MS, FAIS, FICS**
  Former Consultant Surgeon & Head, VMMC & Safdarjung Hospital , Delhi
* **Dr. Dinkar Bakshi, MD**
  Registrar, Deptt. of Paediatrics, Infirmary Hospital, Leeds, U.K.
* **Dr. Sandeep Dham, MD (Medicine)**
  Clinical Astt. Prof., SUNY Health Centre, Broklyn, New York, USA
* **Dr Saurabh Shukla**
  MD, (AIIMS) Delhi
  (Presently associated with WHO Pulse Polio Programme)
* **Dr. Rajesh Kaushal**
  MD (AIIMS) Delhi
* **Dr. N.K. Mendiratta. MD, Anaesthesia, VMMC & Safdarjung Hospital, Delhi**
* **Dr. Nagendra P. MS (Orthopedics), Bangalore Medical College, Bangalore**

*** Coordinator, South African Agency for science and technology advancement.**

For any query please contact Eduheal Foundation helpline : 09350232518

With best wishes

Dr. Sandeep Ahlawat
Managing Trustee
Eduheal Foundation

CLASS - VII

Introduction

At a microscopic level, we are all composed of cells. Look at yourself in a mirror — what you see is about 10 trillion cells divided into about 200 different types. Our muscles are made of muscle cells, our liver of liver cells, and there are even very specialized types of cells that make the enamel for our teeth or the clear lenses in our eyes!

If you want to understand how your body works, you need to understand cells. Everything from **reproduction** to infections to repairing a broken bone happens down at the cellular level. If you want to understand new frontiers like **biotechnology** and **genetic engineering**, you need to understand cells as well.

Anyone who reads the paper or any of the scientific magazines is aware that genes are BIG news these days. Here are some of the terms you commonly see:

- Biotechnology
- Human genome
- Genetic engineering
- Recombinant DNA
- Genetic diseases
- Gene therapy
- DNA mutations
- DNA fingerprinting

Gene science and genetics are rapidly changing the face of medicine, agriculture and even the legal system! Do you know how? Let's have a look and start with the cell of a bacterium. Bacteria are simplest cell possible. By understanding how bacteria work, you can understand the basic mechanisms of all of the cells in your body.

"Cells - the bricks of body !

Nearly all living things - plants and animals (including humans) - are built up from tiny pockets, called cells. (Cells are so small that they can only be seen under a microscope).

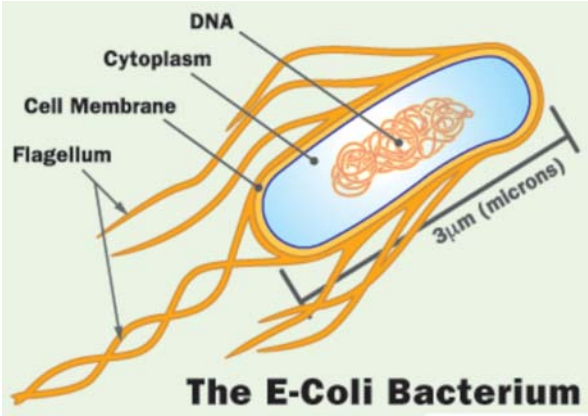
Each cell is a dynamic, living little factory. It is the smallest living unit that can carry out the basic functions of life : growth, metabolism and reproduction.

Your body is made of about **10 trillion cells**. The largest human cells are about the diameter of a human hair, but most human cells are smaller — perhaps one-tenth of the diameter of a human hair.

Run your fingers through your hair now and look at a single strand. It is not very thick — maybe 100 microns in diameter (a micron is a millionth of a meter, so 100 microns is a tenth of a millimeter). A typical human cell might be one-tenth of the diameter of your hair (10 microns). Look down at your little toe — it might represent 2 or 3 billion cells or so, depending on how big you are. Imagine a whole house filled with baby peas. If the house is your little toe, the peas are the cells. That's a lot of cells!

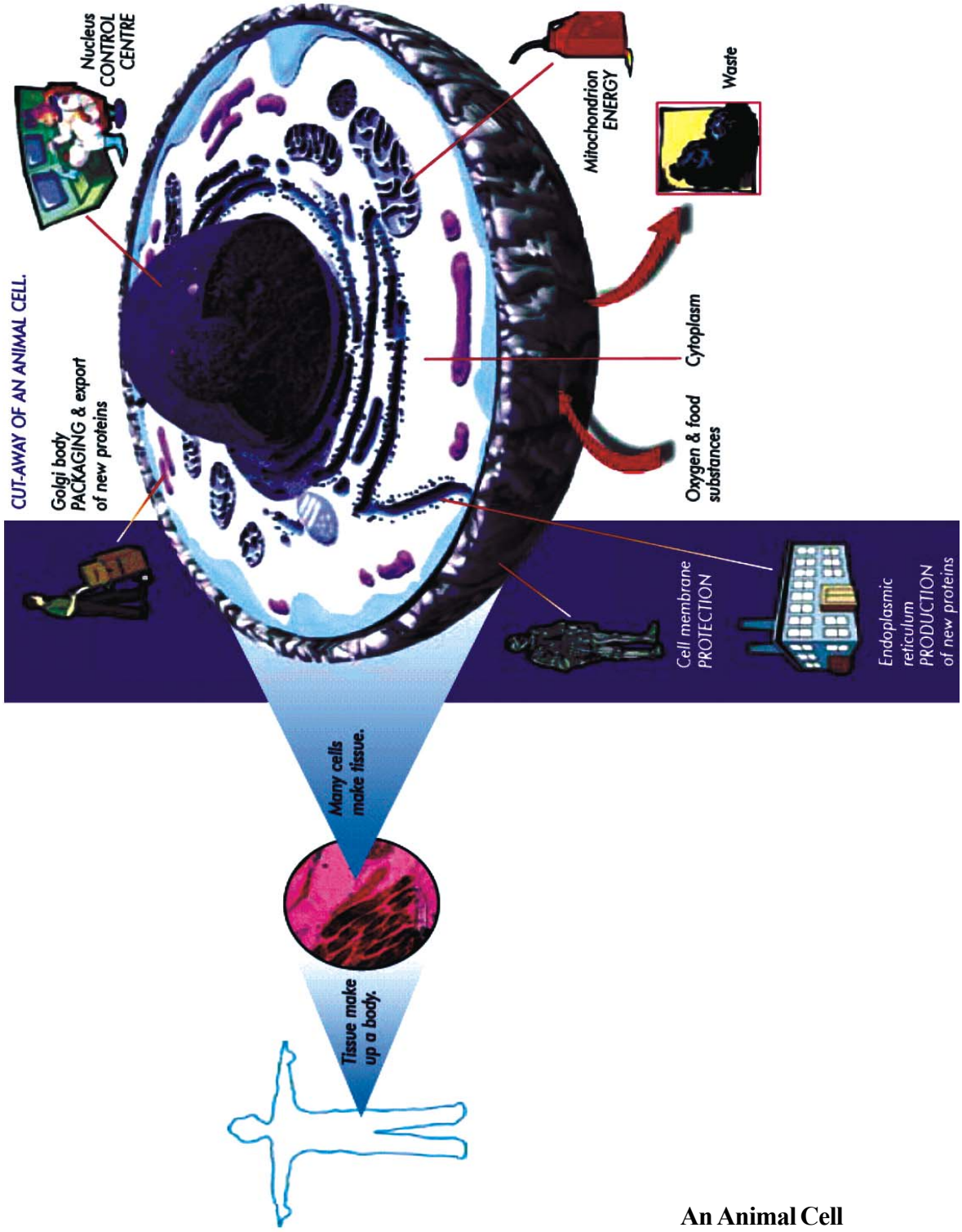
Bacteria are about the simplest cells that exist today. A bacteria is a single, self-contained, living cell. An ***Escherichia coli*** bacteria (or **E. coli** bacteria) is typical — it is about one-hundredth the size of a human cell (may be a micron long and one-tenth of a micron wide), so it is invisible without a microscope. When you get an infection, the bacteria are swimming around your big cells like little rowboats next to a large ship.

Bacteria are a lot simpler than human cells. A bacterium consists of an outer wrapper called the **cell membrane**, and inside the membrane is a watery fluid called the **cytoplasm**. Cytoplasm might be 70-percent water. The other 30 percent is filled with proteins called **enzymes** that the cell has manufactured, along with smaller molecules like amino acids, glucose molecules and ATP. At the center of the cell is a ball of DNA (similar to a wadded-up ball of string). If you were to stretch out this DNA into a single long strand, it would be incredibly long compared to the bacteria — about 1000 times longer! Attached to the outside of the cell are long strands called flagella, which propel the cell. Not all bacterium have flagella, and no human cells have them besides sperm cells.



Human cells are much more complex than bacteria. They contain a special nuclear membrane to protect the DNA, additional membranes and structures like mitochondria and golgi bodies, and a variety of other advanced features. However, the fundamental processes are the same in bacteria and human cells.

All these cells grew from a single cell made when a sperm cell from your father met an egg cell from your mother and fertilized it. This one cell contained all the instructions necessary to make you. You grew because that single cell divided to make two cells, those two divided to make four, and so on. We call this cell division and that is how all living things grow. Cells are always wearing out. New ones then replace them. Some cells last months, and some less than a day. Nerve cells last for a very long time.



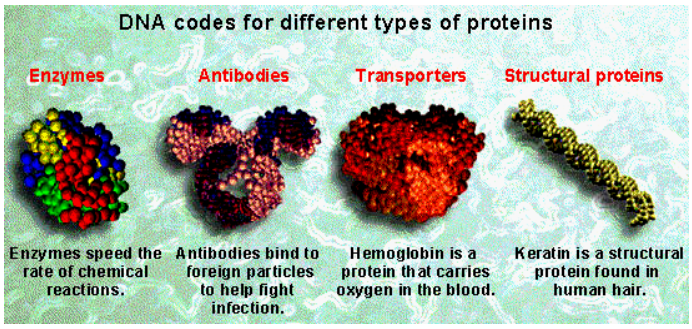
An Animal Cell

Enzymes

At any given moment, all of the work being done inside any cell is being done by **enzymes**. If you understand enzymes, you understand cells. A bacterium like *E. coli* has about 1,000 different types of enzymes floating around in the cytoplasm at any given time.

Enzymes have extremely interesting properties that make them little chemical-reaction machines. The purpose of an enzyme in a cell is to allow the cell to carry out chemical reactions very quickly. These reactions allow the cell to build things or take things apart as needed. This is how a cell grows and reproduces. At the most basic level, a cell is really a little bag full of chemical reactions that are made possible by enzymes!

These enzymes do everything from breaking glucose down for energy to building cell walls, constructing new enzymes and allowing the cell to reproduce. Enzymes do all of the work inside cells.



Enzymes are made from **amino acids**, and they are proteins.

A protein is any chain of amino acids. An amino acid is a small molecule that acts as the building block of any protein. If you ignore the fat, your body is about 20-percent protein by weight. It is about 60-percent water. Most of the rest of your body is composed of minerals (for example, calcium in your bones).

Protein in our diets comes from both animal and vegetable sources. The digestive system breaks all proteins down into their amino acids so that they can enter the bloodstream. Cells then use the amino acids as building blocks to build enzymes and structural proteins.

Interesting facts

Fact 1. There are about a hundred million cells in your body, with many different types with specific functions.

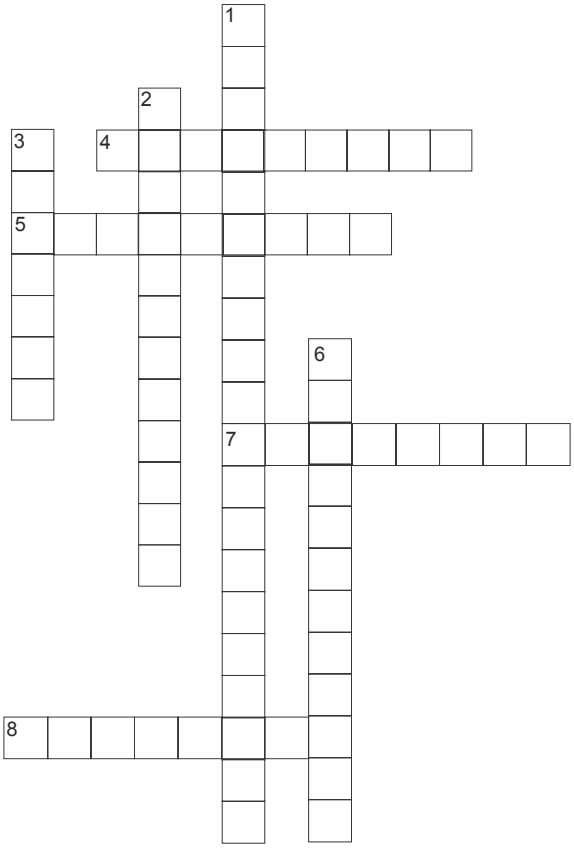
Fact 2. At least 1000 cells would fit side by side across a full - stop.

Fact 3. There is a type of single cell that you can see without the aid of a microscope - an egg. Even an ostrich egg is only a single cell! These cells are marvelously adapted to produce new creatures.

Fact 4. Every kind of animal produces eggs. but they do not all lay eggs. Female mammals, including human, produce very small eggs which they keep inside their bodies.

Fact 5. Do you know that many of the eggs we purchase from the local supermarket are unfertilised eggs, that is, eggs laid by female chickens who have not mated with a male rooster. Unfertilized eggs will never grow into chickens.

Crossword puzzle



ACROSS

4. Proteins are produced here
5. A jelly like fluid within cells.
7. This rigid covering is not found in animal cells
8. Also called the suicidal bag.

DOWN

1. Transports materials within the cell.
2. These structures produce energy for the cell
3. The cell's control center
6. In plant cells, these structures contain chlorophyll

Search for Answers !