

Biology

03.1 Cell Theory

”And there shall in no wise enter into it anything that defileth, or worketh abomination, or maketh a lie: but they which are written in the Lamb’s book of life” - Revelation 21:27

Physical life is all about the cell. All living things are made of the same basic building block called the cell. Whether single and multicellular, whatever is done in the body of any organism is determined by cells. Therefore, understanding the cell is essential to understanding physical life, thinking rationally about life, and making intelligent decisions that affect life.

Cytology is the study of cells

1. All living things are made of cells.
2. All living cells are bound by a membrane, are controlled by the programmable DNA molecule, possess structures and mechanisms to translate the DNA code into proteins, which in turn, guide the metabolic pathways in cells to sustain and perpetuate life.

The discovery of cells

1. Botanist Robert Hooke, in 1665, reported his observation of dead cork ‘cells’ (empty).
2. Van Leeuwenhoek, in 1673, father of microscopy, first man to see, with higher magnification, single celled organisms, and published drawings of ‘animalcules’.
3. Botanist Robert Brown, in 1833, first to publish the finding and name of the ‘nucleus’.
4. Botanist Matthew Schleiden, in 1837, concluded that all plants made of cells.
5. Zoologist Theodore Schwann, in 1839, concluded that all animals made of cells and that multicellular life begins as a single celled ovum.
6. Anatomist & physiologist J.E. Purkinje, in 1840, coined the term ‘protoplasm’. (full cells)
7. Botanist Carl Heinrich Braun, in 1845 states that life is not just made of cells, but that cells are the "basic units of life".
8. Biologist Rudolph Virchow, in 1858, states the law of biogenesis, ‘all cells come from pre-existing cells.’

The Cell Theory formulated from years of discovery

1. All living organisms are made of cells. (non-cell structures made by cells)
2. All functions of life are the sum of cell metabolism.
3. All cells come from pre-existing cells.

Two major groupings of cells:

1. Prokaryotic: no nucleus, and no membrane bound organelles.
2. Eucaryotic

The Relationship of Living cells

1. Unicellular: independent; carries on all necessary life processes

- single cells (bacteria) or colonial cells (mushrooms)
2. Multicellular: dependent; cells specialize in their functions (liver, heart)

Hierarchical order of complexity

1. Human Body, 2. Systems, 3. Organs, 4. Tissues, 5. Cells, 6. Molecules, 7. Atoms, 8. Protons, neutrons, electrons

Attributes all life share in common:

1. Materials and forces:
 - a. All life made of the same atoms.
 - b. All life use the same resources for materials and energy.
 - c. All life governed by same physical laws of science.
 - d. All life share same materials and are subject to same forces.
2. Cellular:
 - a. All life made of cells.
 - b. Cell membrane: All cell Membranes capable of active transport
 - c. Protoplasm: Organic matrix common to all life
 - d. Cell size: All cell types generally the same size in all species.
3. Nutrients:
 - a. All life requires water.
 - b. All life consist of organic molecules.
 - c. All life utilizes and recycles elements found in the earth.
 - d. All life use the same nutrients found in the earth.
 - e. All life capable of acquiring nutrients from environment.
4. Metabolism:
 - a. All life Obtain and use energy.
 - b. All life Make and break molecules using and storing energy.
 - c. All life Make and break molecules for manufacturing needed molecules.
5. Synthesis:
 - a. All life capable of control and regulating of metabolic processes.
 - b. All life show homochirality in living organisms.
 - c. All life capable of translating genetic code into proteins to carry out instructions.
6. Code of life:
 - a. All life possess a meaningful information molecule that gives instruction for control, function, and structure of cells.
 - b. All life use the same code of life alphabet.
 - c. All life store, preserve, and replicate genetic information
7. Reproduction: All life able to duplicating genetic code and reproducing life.
8. Irritability: All life ability to interact with and respond to environment.
9. Homeostasis:
 - a. All life maintains internal environment to resist equilibrium.
 - b. All life capable of responding and adjusting to environmental changes.
 - c. All life capable of eliminating waste from its internal environment.
10. Organization:

- a. All life Self-organize beyond self-ordering.
 - b. All life can obtain distribute materials as needed.
 - c. All life can maintain form.
 - d. All life manifests irreducible complexity
11. Biogenesis: Comes from preexisting life, kind produces kind
 12. Growth: All life grow in size and number
 13. Adaptability: Organisms can change adapt to change in environments.
 14. Death: All life subject to cessation of life processes and assimilates into non-life cycles.
 15. No evidence for life anywhere else but on earth.

Differences between cells

1. Cell types differ in size and shape (neurons, cardiac, muscle).
2. Activation of different genes determines the differences between cell types and functions.
3. Genetic information differences determines differences between cell expression (kingdoms and species).

Differences between cells and mud pies

1. The cell membrane contains elements of dirt in a controlled, homeostatic environment.
2. 32 trillion containment cells in the human body allow for dirt elements and water to be packaged, organized, metabolized in an orderly manner.
3. God given life in cells enables intelligently designed and controlled chemistry in cells to maintain homeostasis.