

Cell Biology ~ LECTURE NOTES

WEEK 1: CELL STRUCTURE

Cell Biology = the study of individual cells and their interactions with other cells

Cell Theory

Because cells are so small they were not discovered until the invention of the microscope in the 17th century. In 1662, Robert Hooke discovered cells using a microscope; Naming the shapes he saw in cork cellulae (small rooms) – this is known to us as cells. In 1673, Antonie van Leeuwenhoek first observed living cells, which he termed “animalcules”, meaning little animals. In 1838/1839, Matthias Schleiden and Theodor Schwann performed early studies of animal cells and brought 200 years of scattered observations together in a simple, testable theory - The Cell Theory:

1. All living things are made up of one or more cells
2. Cells are the basic unit of structure and function in living things
3. All cells are produced by the division of a pre-existing cell

Cell Size

- Cells range in size from one millimetre to one micrometre
- Cells need a large surface area of plasma membrane (regulates uptake and release interfaces with environment) to adequately exchange materials
- The advantage of small cell size is readily apparent in terms of the surface area-to-volume ratio: as a cells size increases, its volume increases much more rapidly than its surface area. The cell surface provides the only opportunity for interaction with the environment, as all substances enter and leave via the surface. The membrane surrounding the cell plays a key role in controlling cell function. Because small cells have more surface area per unit of volume than large ones, control over cell contents is more effective when cells are small.
- Human cell size: most are 10-15 micrometres in diameter

Microscopy

- The reason we cant see small objects is the limited resolution of the human eye. Resolution is the minimum distance two points can be apart and still be distinguished as separate points
- Magnification: the ratio between the size of an image produced by a microscope and its actual size
- Two groups of microscopes based on source of illumination:

- Light microscope: operate with visible light and uses two magnifying lenses to achieve very high magnification and clarity. It has a maximum magnification of 1000x, a resolution of 0.2 micrometres and it is 500x better than the human eye.
- Electron microscopy:
 1. Transmission electron microscopy- beam of electrons are transmitted through the sample. Some electrons are scattered while others pass through to form an image.
 2. Scanning electron microscopy- beams electrons onto the surface of the specimen. The electrons reflected back from the surface, together with other electrons that the specimen itself emits, are amplified and transmitted to a screen.