

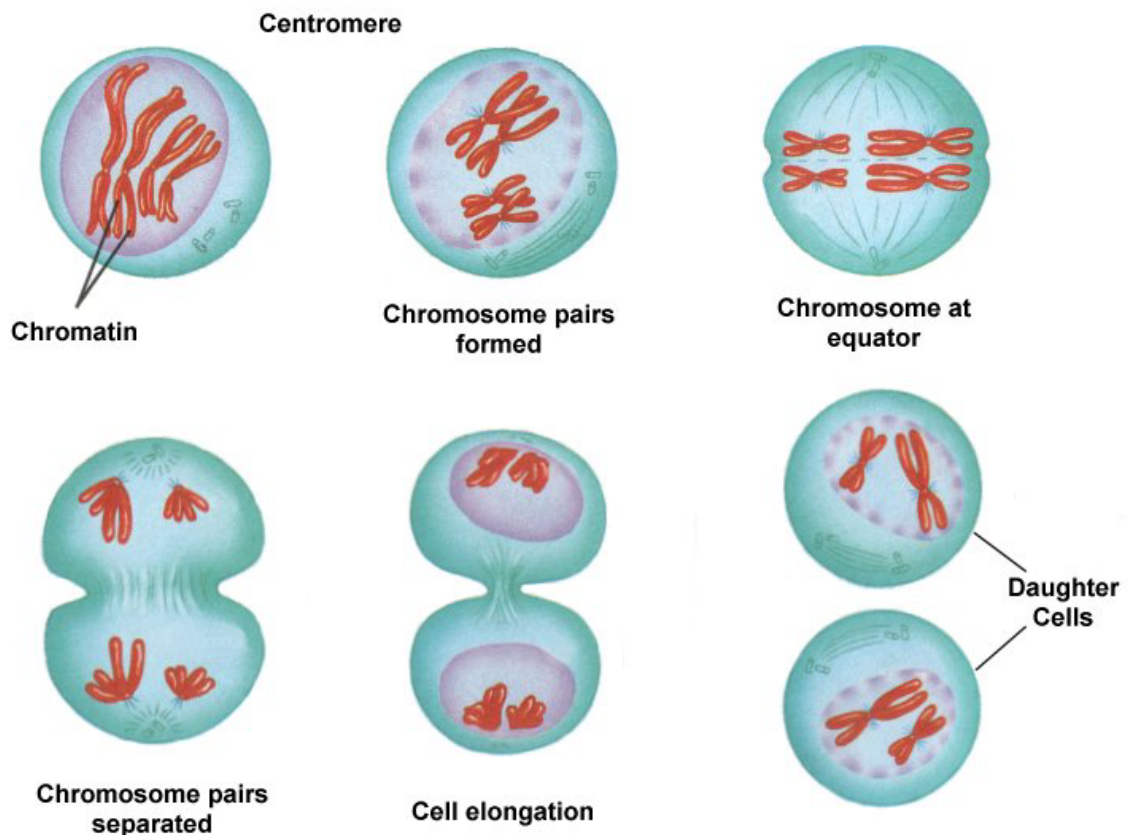
Protoplasm consists of:

- Organic compound known as proteins.
- Fatty substances.
- Carbohydrates (sugars and starches)
- Inorganic salts, especially the phosphates and chlorides of calcium, sodium and potassium.
- Water (a compound of hydrogen and oxygen) – H₂O

In the centre of the cell protoplasm is the nucleus which controls its activity and is essential to life, growth and reproduction of the cell.

Within the nucleus is a special protein called the nucleo-protein. The nucleo-protein consists of a number of minute threads called chromosomes. The human cell contains 46 chromosomes. When the cell divides, the chromosomes split longitudinally so that half of each chromosome goes into each new cell. This process is called mitosis. Chromosomes determine the sex of the foetus.

Each chromosome again consists of a number of smaller portions called genes, which are the parts of the cell which pass on the characteristics of the parent cell.



The process of cell division (Mitosis)

This process in the human reproductive system is where characteristics are transmitted by the genes of the sex cells of the male and female, i.e. hair and eye colour, blood groups and hereditary defects.

The human body is developed from the female egg cell or ovum. The ovum is penetrated by the male cell – the spermatozoan, fusion takes place and a completely new cell is formed, called a zygote.

The zygote attaches itself to the wall of the uterus and proceeds to develop, grow and multiply for nine months of pregnancy. As the cells multiply, specialised formations of cells take place with specific functions. These formations of cells are called tissues. Cells require a fluid environment which is called tissue fluid. There is a constant exchange of fluid between the cell (intracellular) and the tissue fluid (extracellular).

Because the cell wall is semi-permeable, solutions pass in and out of the cell as required.

The volume and composition of intracellular and extracellular fluids must be kept constant. The main processes involved are:

1. Diffusion.
2. Osmosis
3. Filtration

1. **Diffusion** occurs when molecules in the solution are small enough to pass through the tiny pores in the cell membrane.
2. **Osmosis** is the opposite process which draws from the weaker to the stronger solution. In the body, the balancing between salts and water is taking place all the time. For instance, if cells become overloaded with salt (hypertonic) then water from the tissue fluid will be taken in (osmosis) and the cell will then become balanced again (isotonic). If there is an excess of salt in the body, water is retained and not excreted by the kidneys. This accumulation of fluid in the tissues leads to oedema.
3. **Filtration** occurs when the pressures on either side of the cell wall are different. The side with the greater pressure forces fluid through to the other side.

THE TISSUES

Cells packed or grouped together form tissue. There are several different types or shapes of cells forming tissues depending on the function of that part of the body, e.g. compact tissue of the bones causing them to be hard, therefore supporting the body.

The principal types of tissue in the body are:

1. **Epithelium:** Squamous (simple, stratified and transitional)
Columnar or glandular.
Ciliated (columnar)
2. **Connective:** Fibrous
Areolar
Adipose
Lymphoid
Cartilage
Bone
3. **Muscular:** Voluntary or striated
Involuntary or plain
Cardiac or heart muscle
4. **Nervous:** Nerve cells or neurons
5. **Blood Cells:** Red and white cells



TUTOR TALK: A tissue is a collection of similar cells subject to the same laws of growth and development, e.g. muscle tissue, bone tissue.

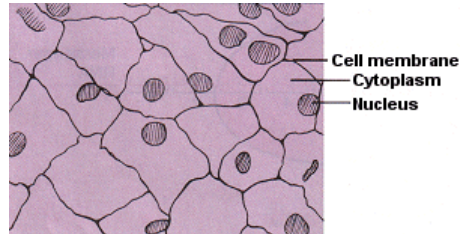
1. EPITHELIUM

The Epithelium is a membrane which covers or lines an internal surface.

a) SQUAMOUS: SIMPLE OR STRATIFIED

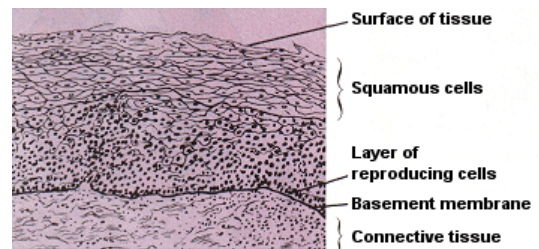
Simple

These are simple flattened smooth cells found lining the alveoli, the interior of the heart (endocardium), insides of blood vessels, lymphatics, pleura and peritoneum.



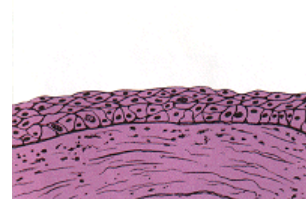
Stratified

These are similar to Simple in that they are flattened, but they are layered. The membrane may be formed of up to twelve layers. They are found in the mouth, pharynx, oesophagus, vagina and part of the urethra. The epidermis consists of stratified epithelium, the outer layer of which are continually being shed.



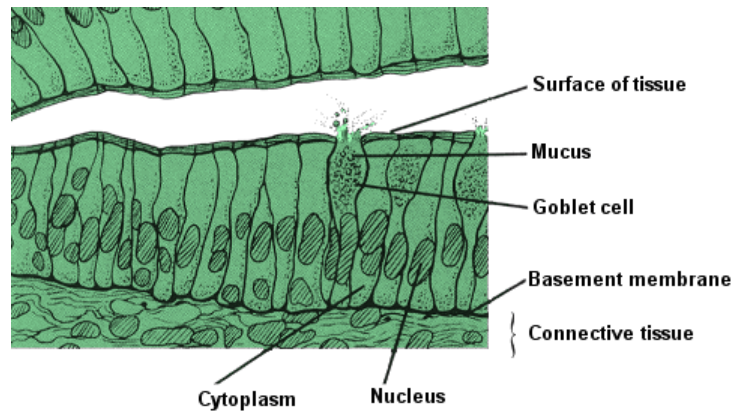
Transitional

Transitional is grouped with the Stratified, but is only about four cells (layers) thick. Found in the bladder and uterus. Adapted to withstand the action of urine.



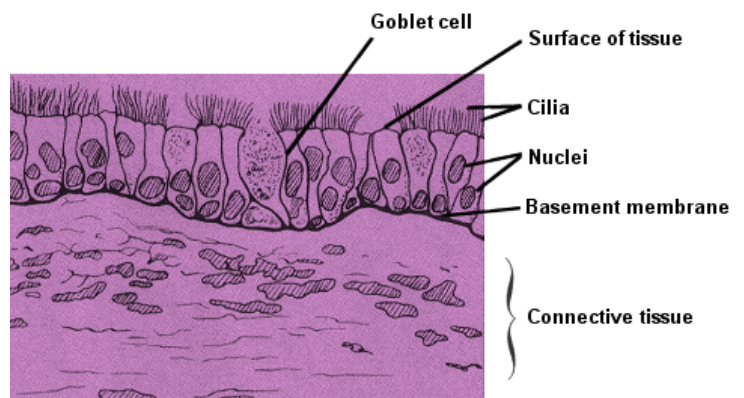
b) COLUMNAR or GLANDULAR

These are cylindrical shaped single layered cells and secrete mucus. Often referred to as the mucous membranes and found lining the food passages. These mucous secretions assist in lubricating the oesophagus in order to help with the passage of food. It is also capable of absorbing certain substances.



c) CILIATED COLUMNAR CELLS

These have hair like processes or cilia on them. These cilia whip backwards and forwards ten times a second and are able to push or sweep onwards in one direction any substance on its surface. They are found in the respiratory system and line the nasal cavities, trachea and bronchi. They convey mucous and dust to the exterior. They are also found in the uterus and Fallopian Tubes moving the ovum towards the uterine cavity.



The functions of the Epithelium are:

- Protection (Simple and Stratified)
- Secretion (Columnar)
- Absorption (Columnar) and
- Movement (Ciliated)

2. CONNECTIVE TISSUE

As implied by the name, these cells are packed together and connected by fibres with a greater or less supporting substance called a matrix. This matrix may be soft, semi-solid or rigid.