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UNIT FIVE MEDICAL SCIENCE AND KNOWLEDGE

READING-TEXT ONE

STRUCTURE OF THE BODY

(1) The human body is an amazingly intricate structure. There are surface details such as the facial features, the hair, and the nails. There are also many meters of intestines, many kilometers of nerves, over two hundred bones, and countless millions of cells. Yet the body is not a hopeless jumble of unlinked parts, joined together in hit-or-miss fashion to form a living being. On the contrary, it represents a striking combination of closely interlinked basic unit.

(2) The common substance of which all living creatures are fashioned is called protoplasm, from two Greek words meaning "first form." This jelly-like substances may be the most complex material in the universe. It is the source of all the bodily activities of living things, large and small.

(3) CELLS. The protoplasm of the human body is contained within cells, which are the structural units in the body. Most of these are too tiny to be seen with the naked eye. The protoplasm of a cell is divided into two parts: nucleus and cytoplasm that surrounds it. A thin, slightly elastic membrane forms the outer surface of the cell. A similar membrane, which is called the nuclear membrane, separates the nucleus from the cytoplasm.

(4) The nucleus is generally round or egg-shaped. It contains one or more dark round bodies, known as nucleoli, and a number of extremely fine, slender threads bearing many irregular granules along their surfaces. These threads are the chromosomes. The factors of heredity - the genes - are located in the chromosomes. With the exception of the reproductive cells, every true cell in a given living creature has the same kind and number of chromosomes. In each human cell, except for the reproductive cells, the number is 46. Each mature reproductive cell has 23 chromosomes.

(5) Living cytoplasm is a watery fluid in which various chemical substances, such as proteins, fats, and salts, are dissolved. Cytoplasm is not just a structureless solution, however. The molecules, of which it consists are arranged in granules, threads, and other structures, all so small that only the electron microscope can reveal them clearly. These tiny structures within the cell are called the cellular organelles.

They are the sites of all-important events, such as the controlled release of energy from nutrients and the manufacture of new compounds on which growth depends.

(6) The cytoplasm also contains nonliving substances, which range from small, clear fat droplets to fine grains of pigment. In certain cases, bacteria and other foreign particles may

be seen in the cytoplasm. Often they are undergoing slow digestion. There are many million of million cells in our body. The red blood cells alone number about twenty-five million million. And yet each one of us originated as a single cell - a fertilized egg. From this egg, all our cells were then derived by a process of cleavage, or division.

(7) This type of cell division is known as mitosis. It is of great importance in the growth and development of the body and in maintenance and repair when the body is fully grown.

Cells are continually dying and being replaced in our bodies. Thousands of dead cells are washed from the surface of the skin every time we bathe. It has been estimated that during every second of our life, 10,000,000 red blood cells die and are replaced by new ones. A muscle cell, for example, is especially adapted to contract and produce movement; a kidney cell, to assist in producing and excreting urine.

(8) **TISSUES.** Similar cells are grouped together in a regular fashion to form tissues. Muscle is one type of tissue. It consists of thousands of fine filaments or fibers piled up side by side. Each fiber is a muscle cell. While it is true that any tissue is made up primarily of a single cell type, other types are also usually present. Thus cells of connective tissue, loosely arranged,

penetrate the spaces in and around the muscle cells and hold them together. Connective tissue knits various other body tissues into working units.

(9) There are four main kinds of tissues. There are: 1) the protective, or lining, tissues that cover the outer surface of the body and line certain internal organs; 2) the muscular, or contractile, tissues; 3) the connective and supporting tissues; and 4) the conducting, or nervous, tissues.

(10) Epithelium. The protective, or lining, tissue is commonly called epithelium. Its cells are called epithelial cells. Some are flat, others are like cubes, and still others are cylindrical in form. The outer part of the skin, for instance, consists of layer upon layer of flattened epithelial cells. In the digestive tract, the epithelial cells are mostly in the form of tall cylinders. The windpipe and parts of the lungs have an inner coating of specially adapted epithelial cells with large numbers of tiny, flexible cilia, or threads, which beat with a whiplike motion sweeping mucus, dust, and foreign matter up into the throat. Not all epithelial cells form lining tissues. Many of them become modified for quite different functions. For example, various types of glands, from the sweat glands in the skin to those that

secrete digestive juices in the stomach, are derived from certain epithelial cells.

(11) Muscle. The second large group of tissue is the muscular type. There are three kinds of muscles. 1) Smooth muscle, is found in the

viscera, or internal organs, of the body. Smooth muscle is spread in delicate strands and sheets throughout the digestive tract, the urinary and reproductive organs, the blood vessels, the respiratory system, and elsewhere. It provides for movements that are not under our control but are indispensable for the functioning of our bodies.

2) Skeletal muscle is more familiar to us. As the main indicates, it is attached to and moves the bones of the skeleton. All muscle cells are long, thin filaments. In the long cells of skeletal muscle are found large numbers of filaments called myofibrils, which run lengthwise through the cytoplasm. They are marked with alternating dark and light bands. 3) Cardiac muscle is found in the heart. Here the cells are joined end to end in a continuous branching network instead of being set off as separate units. This arrangement, in which each cell is directly connected with its neighbors, seems to be well adapted for producing the sustained, rhythmic contractions of the heart.

(12) Connective tissue. When we speak of connective tissue, we have in mind a large number of similar cells all embedded in a fluid or solid

medium, called a matrix. Such diverse things as blood, bones, cartilage, tendons, and ligaments, tissue all fall within this class. In blood, the cells are red and white blood cells. The matrix in which they are contained is the fluid blood plasma. In cartilage and bone, the cells are trapped in more solid substances. The matrix of bone is hard because of the presence of large amounts of calcium salts, which give bone its solidity and strength. The soft connective tissue are composed primarily of irregularly star-shaped cells within a semifluid substance. In addition, fine fibers through the matrix, making it denser and stronger. The strength and elasticity of loose connective tissue is dependent on these fibres. The skin, for instance, is firmly attached to underlying structure by bands of loose connective tissue.

(13) Nervous tissue. The conducting, or nervous, tissues are found in the brain and spinal cord as well as in the nerves that connect these organs with the rest of the body. A nerve cell consists of two elements. One of these is the cell body, a tiny irregular mass of cytoplasm containing the nucleus, several granules, and many extremely fine fibrils. The second element is generally made up of one or more filaments of cytoplasm extending out from the cell body. One type of filament carries impulses away from the cell body. Some

of these filaments are almost unbelievably long - about one meter in length.

(14) ORGANS. Just as the cells are grouped to make tissues, tissues are combined to form still larger and more complex units, the organs - the stomach, the intestines, the trachea, the kidney, the spleen, the liver, the heart, and others. The organ that is called stomach breaks down the food we eat into simpler compounds, which the body can use. The mechanical action of the stomach is made possible by its strong muscular walls. As they contract, anything within the stomach is churned and broken up. Three layers of smooth muscle make up most of the thickness of the stomach wall. One layer runs circularly around the organ, another layer is arranged lengthwise, and the third is oblique. The inner surface of the stomach is thrown into folds, and over these the epithelial covering is fitted like a glove over the fingers. In the deep grooves that lie between the folds, different glands are developed from the epithelium. These glands secrete the various digestive juices that assist in the chemical breakdown of food. In some organs - the stomach, for example, - muscular tissue predominates. In others, like the kidney or liver, special epithelial tissues make up the bulk of the organs. In the brain, nervous tissue is naturally the most important element. The trachea is an example of an organ where connective tissue is predominant.

(15) SYSTEMS. Organs are grouped together to form systems. There are nine principal systems in the human body. They are skeletal and muscular, circulatory, respiratory, digestive, nervous, endocrine, lymphatic, urinary, and reproductive systems.

1) Skeletal and muscular system, or motorial system. This system consists of bones, cartilages, articulations and muscles. The human skeleton is made up of two hundred and six bones. These bones, including skull, the axial skeleton and appendicular skeleton, serve as a framework, giving form to the body, protecting the vital organs, and bearing weight and strain. They are also a chemical laboratory, where red blood cells are manufactured, and a storehouse for the vital mineral calcium, which is supplied to the blood stream as it is required. Human muscle is flesh; it is made up of bundles of fibers, each fiber being a cell. The more than six hundred different muscles in the human body account for all body motion as they alternately contract and relax. They range in length from less than one half of a centimeter to more than one meter.

2) Circulatory system. The circulatory, or cardiovascular, system comprises a pump - the heart - and a network of blood vessels - arteries, veins, and capillaries. Oxygen-rich blood is pumped by the heart to the different parts of the body through the aorta and other arteries.

Passing into the capillaries, it gives up oxygen and food materials (absorbed from the small intestine) to the tissues and receives waste materials (that is, carbon dioxide and water). The blood then passes to the veins and is returned to the heart. This system also plays a role in regulating body temperature.

3) Respiratory system. Respiration is the process by which oxygen is taken up by the body and carbon dioxide is eliminated. This gas exchange takes place in the lungs, the air being conveyed to and from the lungs by the air passages. Oxygen, drawn in when we inhale, passes by way of the pharynx, larynx, trachea, and bronchi to the lungs. It is absorbed by the red blood cells as blood passes through the lungs. The oxygen is then carried in the blood to the cells, where food materials is oxidized and the waste products carbon dioxide and water are formed. The latter products are transported in the blood to the lungs, and are expelled when exhale.

4) Digestive system. In this system, the food that is taken into the body undergoes a series of physical changes, gives up its nutrients to the tissues, and then is discharged as waste matter (feces) from the body. In the course of these transformations, the food passes through the digestive tract, a long tube that is expanded in certain places. The tube is made up of the esophagus, the

stomach, the small and large intestine, the rectum, and the anus.

5) Nervous system. Of all the systems of the human body, the nervous system is the most highly developed and most complex. The nervous system is divided into the central nervous system(CNS) comprising the brain and spinal cord, and the peripheral nervous system comprising the spinal and cranial nerves which connect the CNS to other organs. It serves to control and coordinate the functions of other organs, which it achieves by transmitting information between them and the brain in the form of nervous impulses. Nervous tissue is composed of nerve cells (neurones), and neuroglia which are analogous to the fibroblasts of connective tissue.

6) Endocrine system. The endocrine system is made up of a group of glands called endocrine glands, or glands of internal secretion. They include the pituitary, the thyroid, the parathyroids, the islands of Langerhans (in the pancreas) the adrenals, the gonads (sex glands) and, perhaps, the thymus. These glands secrete hormones, which pass into the blood stream and which help to regulate the activities of the body.

7) Lymphatic system. This system consists of a series of ducts- the lymph vessels - through which flows a fluid called lymph. Lymph is derived from the tissue fluid that occupies the space between cells. It is emptied from the largest

ducts in the system into two big veins of the neck and merges with the blood stream. Most of the lymph vessels have, along their course, enlarged structures called nodes. The nodes trap various particles, manufacture white blood cells (the so-called lymphocytes), and also produce antibodies.

8) Urinary system. The urinary tracts consists of the right and left kidneys in which the urine is formed, the urinary bladder in which it is stored, two ureters which convey the urine down to the urinary bladder situated in the pelvis, and the urethra through which the urine is voided. The kidneys regulate the chemical composition of the body fluids by varying the composition of the urine. Each kidney is about 10 cm long and is situated high up on the posterior abdominal wall, close to the spine. The area of the back overlying the kidney is loin.

9) Reproductive system. The organs concerned with reproduction are known as the genital organs or genitalia, and include the gonads, namely the testes and ovaries, which produce the male and female germ cells or gametes respectively and secrete the appropriate sex hormones, androgens in male and oestrogens in the female.

(10) Besides these systems, the integumentary system is also an important system. It is made up of skin, hair, and nails and the structures associated with the skin. This system protects the underlying tissues, acts as a sensory organ, and

plays an important part in regulating body temperature and in excretion.

NOTES TO THE TEXT

1. in hit-or-miss fashion: - in an irregular manner, 'hit-or-miss' here is an adjective.
2. a living being: - a living thing 生物
3. nucleoli (nju: 'kli: əlai): - the plural form of the word nucleolus (nju: 'kli: ələs) (细胞)核仁
4. gene: - 基因, 或遗传因子。系生物体遗传物质的基本单位, 呈颗粒状, 着在细胞的染色体上, 成直线排列。
5. chromosome: - 染色体。系遗传物质的主要载体。生物性状遗传的主要物质(脱氧核糖核酸DNA)着在细胞核的染色体上, 因而染色体上有很多基因, 所以染色体也是遗传的主体。在人体正常细胞中含46个染色体。
6. The molecules, of which it consists are arranged in granules, threads, other structures, all so small that only the electron microscope can reveal them clearly: - The word 'it' refers to cytoplasm, and 'all so small that....' is an appositive to granules, threads, and other structures.

在细胞质中的分子是以微粒、丝状体及其它组织的形式排列的。它们都非常微小, 只有电子显微镜才能把它们清楚地显现出来。

7. cellular organelle: - 细胞器官
8. red blood cell: - The medical terminology is erythrocyte (i'riθrəusait). 红血细胞, 红血球

9. the axial skeleton and appendicular skeleton:
- that is, the skeleton of trunk and limbs
10. The nervous system is divided into the central nervous system (CNS) comprising the brain and spinal cord, and the peripheral nervous system comprising the spinal and cranial nervous which connect the CNS to other organ.

神经系统分中枢神经系统和周围神经系统（或称末梢神经系统），前者由脑和脊髓组成，后者由把中枢神经系统连接到其它器官上的脊髓神经和脑神经组成。

11. oxygen-rich:- (adj) 富氧的
12. It serves to control and coordinates the functions of other organs, which it achieves by..
.....:- Both 'it' refer to the nervous system, and which clause refers to the whole predicate in the main clause.

---- in the form of nervous impulses:- 以神经冲动的形式

13. the islands of Langerhans:- 兰氏岛，即胰岛，系胰脏中的不规则组织，其组织细胞可分泌一种内分泌物，即胰岛素 (insulin)，其变性为糖尿病原因之一。

---- Paul Langerhans:- (1847 - 1888)

保罗、兰格汉斯，德国病理学家。

SUPPLEMENTARY READING
CELLS, TISSUES AND ORGANS

(1) The unit of structure of the body is the cell. Cells differ widely in their functions, and cells of the same type are aggregated to form tissues, different tissues being combined to form more complex structures, i.e. the organs. Although cells differ widely in their size, shape and other details they do have certain structural features in common. All cells consist of protoplasm surrounded by a cell membrane. The protoplasm is subdivided into the cytoplasm which forms the bulk of it, and a dense ovoid body called the nucleus which is surrounded by a nuclear membrane and may contain one or two small nucleoli.

(2) The nucleus contains the genetic materials of the cell and is responsible for transmitting this during cell division. It also governs protein synthesis and hence is necessary for the continued existence of the cell. There are other distinctive bodies or organelles in the cytoplasm including the rod-shaped mitochondria which are the sites of aerobic energy production in the cell, the endoplasmic reticulum concerned with protein synthesis, and the lysosomes which contain hydrolytic enzymes capable of destroying foreign particles such as bacteria. Extraneous matter may be engulfed by the cell by a process known