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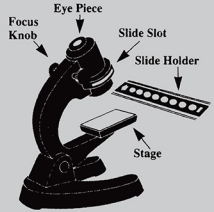
MICRO-SLIDE-VIEWER™



Face the Micro-Slide-Viewer so that as much light as possible falls on the white Stage.

Insert the numbered end of the Slide Holder into the Slide Slot of your Viewer, moving it from your right to left.

View with your eye close to the Eye Piece.

With Slide No. 1 in place, focus by turning the Focus Knob.

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7 PIGMENT DEPOSITS IN THE LUNG – x.s. – Stained (325x)

Particles that enter the air tubes but escape all the defenses end up in the alveoli. Here they are engulfed by amoeba-like scavengers called DUST CELLS whose job seems to be keeping the alveoli clean. The dust cells carry the particles away from the alveoli and deposit them in the connective tissue of the lungs.

The black deposit in this Microslide developed in exactly this way. It could be coal dust (coal miner), or smoke particles (city dweller), or carbon particles from cigarettes (heavy smoker). The lungs are discolored, but this in itself is not necessarily harmful.

However, heavy deposits of foreign material may cause an increase in the amount of fibrous connective tissue. This may happen when a miner breathes in large amounts of rock dust and develops silicosis. The increase in connective tissue, such as you see in this Microslide may damage the air sacs and create serious respiratory problems.

Look up emphysema. What change in lung structure occurs? How does this affect respiration?

8. MITOCHONDRIA AND ENERGY RELEASE – Electron microscope (60,000x)

The purpose of respiration is to release energy. However, this cannot be a sudden release in one large blast, as in an atomic explosion. The energy must be released slowly, in small bursts, without flash, flame, or noise.

Special structures within the cell, called MITOCHONDRIA (singular = mitochondrion), accomplish this type of slow, quiet energy release. One mitochondrion from a cell of human bronchial epithelium is enlarged 60,000 times in this Microslide. It is a submarine-shaped structure, closed all around by a double membrane. The inner membrane is folded into many shelf-like structures (S). The shelves are sites for RESPIRATORY ENZYMES having the ability to break up the carbon chain of a sugar molecule. But they do not break it up all at once. Each enzyme chops off one carbon with its attached hydrogens. The sugar molecule is then passed along to another enzyme on the assembly line, which chops off a second carbon. As the process is repeated, the carbon chain is gradually dismembered. But each time a bit of it is chopped off, a small burst of energy is released. This packet of energy is immediately captured in a molecule of ATP and carried off to some part of the cell where energy is needed. However, as the hydrogens and carbons are chipped away from the chain, they are met by oxygen molecules which act as receptors. Oxygen combines with the carbon to form CO_2, and with the hydrogen to form H_2O. This explains why CO_2 and H_2O are waste products of respiration.

Look up adenosine triphospate (ATP). What is it, and how does it serve to transport energy?

Microslides 1 and 8 by courtesy of Oscar Auerback, M.D., Senior Medical Investigator, Veterans Administration Hospital, East Orange, New Jersey.

SET 72

THE RESPIRATORY SYSTEM

The energy requirements of the human organism may be compared to those of a seven-day clock. Both are constantly running down because they are using up their energy. Winding the clock stores energy in the mainspring. The energy is given back a little at a time as the spring unwinds. When all the energy is given off, the clock stops – unless you wind it again. Eating food provides your body with a store of energy. Oxidation releases this energy a little at a time to the working cells. If all the energy is released, the cells must stop functioning – unless the supply is replenished.

We usually say that food-energy is released by oxidation. Thus, the union of oxygen with glucose molecules ($C_6H_{12}O_6$) breaks them down to CO_2 + H_2O, and releases energy.

$C_6H_{12}O_6 + 6O_2$ [•] ENERGY + $6CO_2 + 6H_2O$

This equation is an oversimplification of what really happens in the body. Still, oxygen must be taken in and waste gasses eliminated by a constant exchange with the outside air.

The term RESPIRATION includes all the body activities relating to energy release. The special body system involved in gas exchange is called THE RESPIRATORY SYSTEM.

You will probably see in each Microslide much more than you can explain or understand. Your textbook may provide some of the answers. Continue your inquiry in the library, in the laboratory and in discussion with other students and teachers. If you see something in a slide for which you cannot discover an explanation, do not be discouraged. You may be asking a question for which no one has yet found the answer.

The magnification given, for example, Microslide 3 – (65x) means that the microscope was set at that power when the photograph was taken.

1. BRONCHIAL TREE (HUMAN) l.s. - Stained

Air entering the respiratory system through the nostrils is warmed and moistened in the nasal passages. Dust particles are filtered out by a forest of hairs. The conditioned air enters a series of branching air tubes known as "the bronchial tree." As you can see in the Microslide, they are arranged like an upside-down tree. (Turn the Microslide upside-down to convince yourself.)

There is a single large tube called the TRACHEA (windpipe), comparable to the "tree trunk." It divides into two major branches - the BRONCH. Each BRONCHUS enters a lung and breaks up progressively into smaller and smaller tubules, corresponding to the stems and twigs of the tree. The smaller air tubes are called BRONCHIOLES.

You might be interested in finding out how the LARYNX (voice box) is related to the bronchial tree.

By PHILIP GOLDSTEIN