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DETROIT, MICH. -- Using techniques which enable them to see structures as small as about 20 billionths of an inch, scientists at Henry Ford Hospital have compared tissues removed from the lungs of bronchitic smokers and normal non-smokers.

The studies show that cells lining the breathing tubes of heavy cigarette smokers with chronic bronchitis were different in many ways from those of non-smokers; although the differences were only a matter of degree. Smokers' cells had changed, but they neither gained nor lost essential cell structures.

This work was described by the American Cancer Society today in a report on Society-supported research by Drs. Geoffrey L. Brinkman of the Hospital's Pulmonary Division and John H. L. Watson of the Physics Department of the Edsel B. Ford Institute for Medical Research.

Samples of the bronchial lining were removed either by bronchoscope or during exploratory operations on the chest. They were immediately fixed, presumably in their natural form, and prepared for viewing in the electron microscope. The hardened samples were cut in slices about two millionths of an inch thick.

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Under the electron microscope extremely fine structures within cell membranes and other cell constituents could be viewed clearly. Even large molecules could be distinguished over the vast landscape of the cell geography.

Of particular interest were 1) ciliated cells whose whiplike appendages serve as brooms in sweeping particles out of the breathing tubes, and 2) goblet cells which produce mucus that engulfs particles and allows them to be coughed up.

The tiny whips, called cilia, were of the same construction in the human bronchus as they are in protozoa and in other species. Each cilium in the broom was composed of nine double outer fibers and two single central fibers; a thin filament seemed to run through both central fibers. The cilia were anchored in basal bodies of the cytoplasm; bundles of fine fibers extended from the basal bodies to mitochondria, the cell powerhouses, and these fibers may serve as pipelines which transport the energy required to keep the brooms sweeping.

There were about 12,000 million cilia per square inch of bronchial lining.

Goblet cells were viewed in all stages of development. As they matured, they filled with mucus granules which pushed other cell structures aside.

These changes were noted in smokers' cells:

1) Projections of the cell protoplasm, which increase the cell's surface and possibly its ability to consume from the outside and secrete from the inside, were markedly reduced;

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- 2) mitochondria were altered or underdeveloped, indicating subnormal power production;
- 3) more frequent occurrence of what appeared to be secretion droplets;
- 4) more space between cells -- possibly due to tissue water logging; and
- 5) more mature goblet cells, and increased frequency and size of fatty granules.

Smokers' cells appeared to have the normal number of cilia, and the internal structures of these whips seemed normal.

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