

BACTERIOLOGY

Electron Microscope Shows "Strep" Has Outer Membrane

Observation Accounting for Grouping of These Germs One of First Bacteriological Results with Instrument

THE streptococcus germ, one of the commonest of disease microorganisms, has a rigid outer membrane that accounts for the grouping of these germs in chains.

This is one of the first bacteriological results of research with the electron microscope conducted by Dr. Stuart Mudd of the University of Pennsylvania School of Medicine's department of bacteriology with the collaboration of Dr. L. Marton of the RCA Manufacturing Company who took the electron micrographs. Dr. Mudd reported his findings to the National Academy of Sciences meeting at the University of Pennsylvania. (See *SNL*, Oct. 12.)

These rigid outer membranes that surround the streptococci are different in composition from the inner protoplasm. With the usual crude straining methods and use of ordinary optical microscope, the streptococcal cell appears to be a tiny lemon-shaped mass of undifferentiated protoplasm. Pictures made with the electron microscope enlarge the germs some 12,000 or more times and reveal the outer cell membrane.

The variety of germ studied by Dr. Mudd was the beta hemolytic streptococcus of Lancefield's Group A in the mucoid, smooth and rough phases. In one case a few of the germs were subjected to a short period of sonic vibration to disintegrate them, producing

"ghost" cells. These mixed-up cells do not differ significantly in outline from the intact cells, but do differ in opacity to the electron beam, due to the escape of protoplasm from the interior of the cell.

Dr. Mudd will give details of his discovery in a joint paper with Dr. David B. Lackman in the *Journal of Bacteriology*.

Insight into the nature and meaning of fine structure will not necessarily increase in proportion to the increase in resolving power, in Dr. Mudd's opinion.

"To publish very much on biological aspects of research with the electron microscope at this stage," Dr. Mudd said, "would be almost as rash as for Alice to report on the flora and fauna of Wonderland after one or two trips down the rabbit hole."

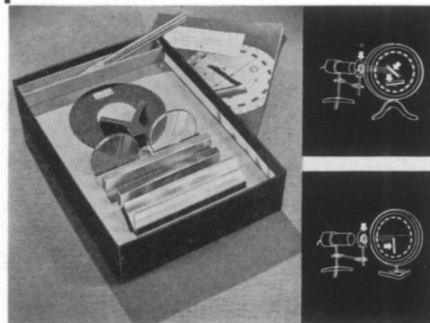
Within the minute confines of the streptococcus germ, a mere micron in diameter, there are produced such a large variety of products that, as Dr. Mudd puts it, a large factory would be necessary to manufacture them outside the living cell. Dr. Mudd and his colleagues have discovered that these germs have amazing metabolic potentialities, producing among other things a substance that kills rabbits and mice. He concludes that the internal material of the cells must be very complex rather than simple and uniform as hitherto believed.

The streptococci have been raised by Dr. A. M. Pappenheimer and George Hottle of the University of Pennsylvania upon a synthetic medium that gives double the growth upon ordinary germ food. This new medium includes six B vitamins, essential amino acids, carbon and minerals.

Science News Letter, November 9, 1940

Army aviators are conducting a series of test *parachute jumps* from high altitudes, to learn, for instance, how far a flier must fall in an emergency jump before pulling the rip cord of a parachute, to avoid asphyxiation in the rare and cold atmosphere.

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