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MICROORGANISMS AND MICROBIOLOGY

KOCH'S POSTULATES

Section 1.6 Pasteur, Koch, and Pure Cultures, p. 12



In the 19th century, Robert Koch provided the first experimental evidence for the theory that microorganisms cause disease. Through his work he developed criteria, now called Koch's postulates, for proving that a specific microorganism causes a specific disease. With these postulates as a guide, Koch and other microbiologists discovered the causes of many important diseases of humans and other animals.

Koch's Postulates

In developing his postulates, Koch worked with anthrax, a spore-forming bacterium that is found mostly in cattle, but that can also infect other animals. He experimented with mice and observed with microscopy that the blood of diseased mice contained high concentrations of anthrax bacteria.

Not knowing whether this bacterium caused the disease or resulted from the disease, Koch introduced anthrax bacteria into healthy animals, by injecting them with some of the bacteria-laden blood. He found that the healthy mice soon succumbed to the disease.

In all cases, the diseased mice contained the bacterium in their blood, while healthy animals did not. This observation led to Koch's first postulate.

Postulate 1

The suspected pathogenic organism must always be present in animals suffering from the disease and should not be present in healthy individuals.

Koch also discovered a method for cultivating the bacterium in nutrient fluids outside of the mouse's body. The *in vitro* culturing allowed Koch to establish pure cultures of the pathogen and led to his second postulate.

Postulate 2

The organism must be cultivated in pure culture away from the animal body.

From these pure cultures, Koch infected healthy mice and found that they soon succumbed to the disease. This observation led to his third postulate.

Postulate 3

Cells from a pure culture of the suspected organism should cause disease in a healthy animal.

To confirm that the anthrax bacteria had multiplied in the animal, Koch checked the blood again by microscopy and prepared a laboratory culture. He confirmed that the bacterium in the latest diseased mouse was the same as in previous cases of the disease, an observation that led to his fourth postulate.

Postulate 4

The organism should be reisolated and shown to be the same as the original.

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