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Research Brief

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Are Soils in Agricultural and Natural Ecosystems a Source of Anthrax Bacterium ?

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Anthrax and the bacterium that causes anthrax, *Bacillus anthracis*, have long been considered prime candidates for use in biological weapons, and public interest in the disease has increased dramatically with recent events. The disease may take three different forms: 1) pulmonary; 2) cutaneous; and 3) gastrointestinal. The pulmonary form arises from inhalation of small *B. anthracis* spores; the cutaneous form results from viable spores entering a cut or abrasion on the skin; and the gastrointestinal form comes from eating undercooked meat from an infected animal. All three forms may be lethal, but the pulmonary form has a much higher mortality rate than the other two.

Naturally occurring anthrax is very rare in the United States, although it does occur in developing nations. The disease is generally spread through direct contact with infected animals, and not through contact with infected people. The most common form of anthrax is cutaneous and is acquired by people working directly with infected livestock in developing nations. The last reported case of anthrax from natural sources in the United States was in 1992.

Bacillus anthracis is a rod shaped gram positive cell that produces very hardy and long-lived spores. The primary source of the anthrax pathogen in soils is from infected cattle, and pasture soils may contain viable anthrax spores for long periods of time (years or decades) after a cattle infection. *Bacillus anthracis* is an obligate pathogen, meaning infection of a host (such as cattle) is required for the microorganism to grow. The bacterium is not thought to proliferate naturally in soil.

The presence of these spores in soils does not pose a serious threat to human health for two reasons. 1) Contraction of the disease generally requires infection with much higher concentrations (8,000-10,000 spores) than would typically be found in airborne particulates from an infected pasture. This is also the primary reason the disease is not transmitted from person to person. 2) The spores bind to soil particles that prevent the spores from traveling deep inside the lungs, greatly decreasing the likelihood of pulmonary infection. Few, if any, anthrax cases have been reported for soil-borne disease. Livestock may be infected when grazing in infected soils.

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