

Ozone and Anthrax – Knowns and Unknowns

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Abstract

Mailings of envelopes containing anthrax spores (*Bacillus anthracis*) have caused serious disruptions of business operations in various parts of the United States, and several people tragically have lost their lives from resulting exposure to anthrax. These incidents have caused U.S. government agencies to investigate this material and to evaluate methods of neutralizing it. Ozone is one candidate countermeasure.

In this paper, what is known about ozone and its ability to destroy *B. anthracis* spores (and accepted surrogates) is discussed. High relative humidity is required to “soften up” the spore coating prior to addition of any disinfectant. Ozone clearly is a sufficiently powerful oxidant to destroy *B. anthracis* in relatively short exposure times. Of major concern, however, is ozone’s equally clear ability to produce collateral damage in areas where it is used.

Research on ozone is needed to fill data gaps, in order to convince government authorities in charge of anti-terrorism activities that ozone should be included as a prime candidate for combating anthrax contaminations. It is equally important that those in the ozone industry be aware of the known facts and data gaps concerning ozone -- in order to minimize the number of (well-intentioned) overclaims for ozone that may be doomed to failure and give ozone a black eye in this field.

Key Words

Ozone; Anthrax; *Bacillus anthracis*; *Bacillus subtilis*; *Bacillus globigii*; *Bacillus* spores; Relative Humidity Effects on Inactivation; Hydrogen Peroxide;

Background

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*, that occurs commonly in wild and domestic animals such as cattle, sheep, goats, camels, antelopes and other animals that eat grass. It can also occur in humans when they are exposed to the hides, wool, hair or meat of infected animals.

Three types of anthrax infections are known. Infections in humans most commonly develop on the skin (cutaneous). Thorough washing of the skin can

reduce the possibility of infection after exposure. Respiratory (inhaled) and gastrointestinal infections from naturally occurring anthrax are rare in humans. In order to develop respiratory anthrax, humans must inhale a minimum of 1000 to 2500 spores at one time.

What are the symptoms? Skin infections start with a raised, itchy bump that develops into a painless ulcer with a black center. Gastrointestinal infections cause nausea, loss of appetite, fever, vomiting,