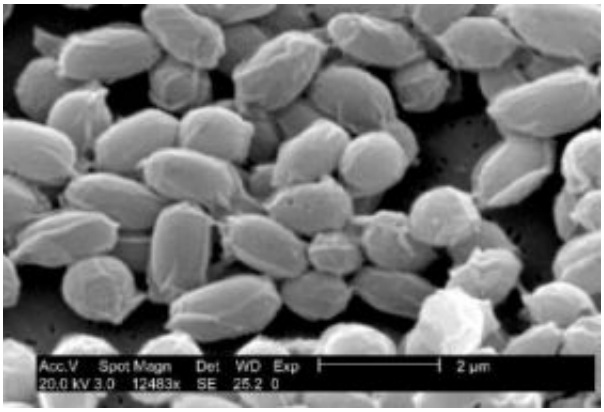
Irradiated anthrax can be sequenced—fast

November 13 2015



Anthrax spores as photographed under an electron microscope. Credit: Courtesy of Centers for Disease Control and Prevention

These days, mail addressed to selected government offices gets irradiated, in order to kill any biological agents, notably anthrax spores. The downside of this is that viable spores have been needed to identify the anthrax strain, which can be critical to treating those infected. But now Henry S. Gibbons, PhD, has shown that full sequences can quickly be determined from irradiated spores. The research is published November 13 in *Applied and Environmental Microbiology*, a journal of the American Society for Microbiology.

In the study, the investigators irradiated spores of *Bacillus atrophaeus*, a non-pathogenic strain that, like anthrax, makes spores. The strain the authors used has a number of genetic mutations, as compared to the reference strain, which they hoped they would detect. They also used a

vaccine strain of Yersinia pestis, the bacterium that causes plague, but which does not form spores. Irradiation breaks DNA sequences into fragments. The investigators sequenced the fragments, and then documented the sequences. They entered the fragment sequences into a computer, which they programmed to determine the full sequences of the strains.

"The full sequences were almost indistinguishable from control materials," said Gibbons. "All known mutations were found in the irradiated materials."

The research was motivated by the need for quick recovery of microbial signatures following deliberate releases such as the 2001 anthrax attacks, said Gibbons, who is a research microbiologist at the US Army Edgewood Chemical Biological Center, Aberdeen Proving Ground, Maryland.

These attacks, which began a week after 9-11, and were aimed partly at Congressional offices, killed a photo editor, two postal workers, and two others, the first anthrax deaths in the US in 25 years.

"Rapid sequencing of irradiated materials from a biocrime would allow quick characterization of the material," said Gibbons. That could answer important questions. For example, the genome might contain a drug resistance cassette, important information for knowing how to treat any infections.

More generally, rapid sequencing could also reveal whether a strain had been genetically engineered, said Gibbons. "This was one of the first questions asked during the anthrax investigation. It was motivated by the fact that the Soviet program had developed some engineered pathogens." It would also help determine the sophistication of the perpetrators, which would be important in tracking them down, he said.

Provided by American Society for Microbiology