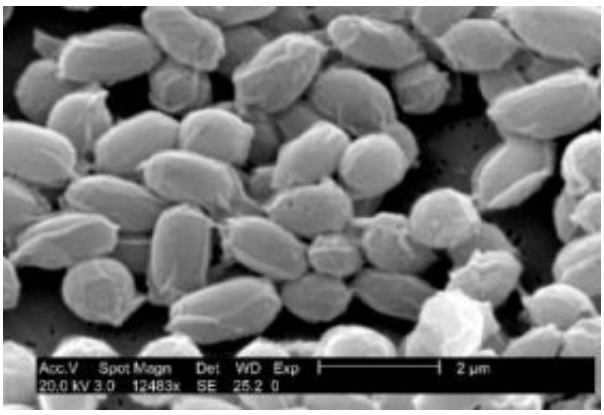
Researchers find animals killed by anthrax leave behind enticing grasses for herbivores, allowing disease to spread

October 1 2014, by Bob Yirka



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

A large team of researchers with members from around the globe has found that when anthrax kills an animal, the carcass left behind can cause more abundant spore-filled grass growth, enticing herbivores which help spread the disease after they eat it. In their paper published in *Proceedings of the Royal Society B: Biological Sciences,* the researchers describe their multi-step study and what they learned as a result.

Technically, anthrax is a bacterial disease—it's caused however, by spores that enter the body of its victims and multiply—spores that are formed by the bacteria and live in the environment for long periods of

time. Victims contract the disease by inhaling the spores, coming into contact with them (where the skin has an opening) or by eating meat with spores in it. In this new effort, the researchers wondered how it was that the bacterial spores were able to spread themselves around in the environment. To find out, they started by looking at how the spores impact vegetation. That led to a prior paper where the researchers reported finding that spores in vegetation caused more lush growth. That suggested that animals would be more likely to consume spores in the grasses and carry them to another location and then die, repeating the cycle. To find out if that was indeed the case, the researchers ventured to Etosha National Park in Namibia to study anthrax transmission in zebras.

The researchers located 26 zebra carcasses around the park, half of which were killed by anthrax, half of which died due to other causes. The researchers took grass samples periodically and photographed (using motion sensing cameras) all of the sites over the course of three years. In so doing, they were able to watch as the carcasses decomposed while they simultaneously monitored spore levels in the grasses. They found that carcass sites from anthrax victims did indeed grow more lush—they also found that other animals were just as likely to visit either site, but herbivores, particularly zebras were four time more likely to eat those grasses, compared to the sites where the zebras had died from other causes. They note also that zebras have the highest death rate from anthrax in the park.

The study appears to show at least one example of how anthrax spores are able to move around in the environment—more studies will have to be conducted to see if it applies to other species and areas.

More information: Fatal attraction: vegetation responses to nutrient inputs attract herbivores to infectious anthrax carcass sites, *Proc. R. Soc. B* 22 November 2014 vol. 281 no. 1795 20141785, Published 1 October 2014. DOI: 10.1098/rspb.2014.1785

Abstract

Parasites can shape the foraging behaviour of their hosts through cues indicating risk of infection. When cues for risk co-occur with desired traits such as forage quality, individuals face a trade-off between nutrient acquisition and parasite exposure. We evaluated how this trade-off may influence disease transmission in a 3-year experimental study of anthrax in a guild of mammalian herbivores in Etosha National Park, Namibia. At plains zebra (Equus quagga) carcass sites we assessed (i) carcass nutrient effects on soils and grasses, (ii) concentrations of Bacillus anthracis (BA) on grasses and in soils, and (iii) herbivore grazing behaviour, compared with control sites, using motion-sensing camera traps. We found that carcass-mediated nutrient pulses improved soil and vegetation, and that BA is found on grasses up to 2 years after death. Host foraging responses to carcass sites shifted from avoidance to attraction, and ultimately to no preference, with the strength and duration of these behavioural responses varying among herbivore species. Our results demonstrate that animal carcasses alter the environment and attract grazing hosts to parasite aggregations. This attraction may enhance transmission rates, suggesting that hosts are limited in their ability to trade off nutrient intake with parasite avoidance when relying on indirect cues.