Predictability of anthrax infection in the serengeti tanzania article review exam...

Environment, Animals

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Background

Each year, millions of mammals cross the Seregenti. The migration of the wildebeest is one of the greatest natural wonders of the world. But there is something not so wonderful in the Serengeti—an endemic disease called anthrax that strikes and kills without discrimination. It kills humans, livestock, and wildlife.

This study is about the ecopathology of Bacillus anthracis (Cohn), the pathogen that causes anthrax. Anthrax is not a big problem in most countries, but anthrax is still common in Africa because sanitation is poor, and there is no access to vaccines.

The ecology of anthrax is not well understood; all that is known about the disease is that its outbreaks are sporadic and unpredictable; and that when it hits, it devastates the domestic and wild animal populations. It kills people too.

Humans get infected with anthrax when they come in contact with infected carcasses, or if they eat meat from an infected animal. Carnivores also get anthrax by eating infected meat, but it was not clear how herbivores get the disease. The most common wild animals that are infected by anthrax are the impala, kudu, buffalo, and zebra, but not all wild species are infected at one time, and there seems to be no pattern.

Hamson et al believed that ecological factors may affect how and when and under which conditions Bacillus anthracis (Cohn) infects such a wide range of species. The scientists hoped to indentify factors in the environment and climate that associated with the outbreaks of anthrax, as well as any patterns of infections in the various species of wild animals.

This study was on the pattern of outbreaks of anthrax in the Serengeti in Tanzania. This ecosystem is large (20 000 km2) and varied; its habitats include forests, swamps, kopjes, grasslands and woodlands. The study began in 1996 and ended in 2011.

Methods

Hamson and his team gathered data from a wide variety of sources. They collected data from many different agrarian and pastoral communities east and west of the Serengeti National Park, in the Ngorongoro District, and from wildlife populations in and around the reserves. They even got data from tour guides, to determine a source of outbreak. If they could, the scientists visited the affected areas.

The scientists collected ecological and climatic data on the areas of

outbreak; including the elevation, amount of rainfall, the type of vegetation, distances to a water source, and the chemistry of the soil.

The collection of pathology data was passive, gathered from veterinarians, rangers, scientists, and others. If possible, samples were taken from carcasses and later examined in the laboratory; but most of the time, the scientists had no access to a laboratory, so data collection in most cases was limited to visual inspections. Data of anthrax on humans and livestock were collected from veterinary clinics and hospitals.

Results

There were periodic outbreaks of anthrax throughout the study period, with major events happening in 1998, 2003, 2006 and 2009. Many different species were infected, but the particular species that got anthrax the most varied from outbreak to outbreak.

An interesting finding is that certain species were infected at the same time; i. e., buffalo-impala, buffalo-giraffe, livestock-impala, and wildebeest-gazelles. And, what is really curious, a correlation was found between anthrax infection in humans and zebra.

The greatest majority of infected animals were herbivores, which is to be expected. Only two infected carnivore carcasses were discovered, of a cheetah and serval cat. This was odd, because analyses of the serum of the various species showed that lions and hyenas had much higher seropositivity levels than any of the herbivores. But they also found a correlation between

the alkalinity of the soil and serum anthrax levels in lions and buffalos. Many buffalo carcasses were also discovered along rivers.

Another large variation in the pattern of anthrax cases was in the location of the outbreaks. In addition to river basins, anthrax was found in the plains, along swamps, around kopjes, and inside woodlands. The only predictor location was the river basin.

Anthrax in humans was just as sporadic; but in this case, it always originated in villages with livestock. Here too, a correlation was found between anthrax and alkaline soils. For domestic dogs, anthrax correlated with age, soil chemistry, and location; older dogs living in pastoral villages where the soil was alkaline were at higher risk.

Weather was also a significant predictor. The largest outbreaks in wildlife were during extreme weather conditions, either long periods of draught or of heavy rains.

Conclusion

Anthrax is endemic in Africa. It is difficult to predict when or where it will strike. But we do know that when it strikes it will cause great loss to livestock and wildlife. And, humans will die.

It is critical for public health and for wildlife conservation to be able to predict the next outbreak of anthrax; but, there are too many factors involved in the ecopathology of Bacillus anthracis (Cohn): it strikes

sporadically, in a wide diversity of environments, under various weather conditions, selecting any number of hosts.

Nevertheless, this study uncovered certain patterns that might lead to better understanding of the disease. We now know that anthrax is associated with alkaline soils, extreme weather conditions, affects a few local species more than others, and occurs most frequently along river basins. These preliminary data may help communities at high-risk of anthrax make decisions to protect themselves and their livestock.

Reflections

I was really impressed by how the scientists conducted their study—for many years, in a huge area, and with so many species of wild animals. I didn't realize that there existed this type of ecological study; that is, I thought a study of anthrax would be done in a laboratory, but in this study, most of the data were taken and analysed in the field.

I could not understand some of the terminology, for example, the difference between " seropositivity " and " seroprevalence." I could not understand why the carnivores had high seroprevalence and still did not die. I also wondered why there was a correlation between human and zebra anthrax infection, but not between humans and their dogs. Surely they spend more time with their house dogs than with wild zebra?

I chose this article for three reasons: (1) I have always been fascinated with the Serengeti (because of the migration of the wildebeests), (2) I like

medicine (and fear anthrax), and (3) I hope to become an entrepreneur in the field of medical services.

Work Evaluated

Hamson, K., et al. 2012. " Predictability of anthrax infection in the Serengeti, Tanzania"

Journal of Applied Ecology 48 (6): 1333-1344.

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