

# Anthrax – General Information and Vaccination

Anthrax, a disease of mammals, including humans, is caused by a spore-forming bacterium called *Bacillus anthracis*. This is one of three information sheets on anthrax. The other information sheets include discussions of safety aspects in dealing with anthrax and clinical signs and diagnoses.

## Anthrax Overview

Anthrax has an almost worldwide distribution and is zoonotic (i.e., a disease shared by animals and humans). All mammals appear to be susceptible to anthrax to some degree. Ruminants such as cattle, sheep, and goats are the most susceptible and commonly affected farm animals. They usually contract the disease through ingestion of soil-borne anthrax spores and die acutely. Horses, swine, cats, and dogs are less susceptible and in them the disease usually has a more protracted course. Among laboratory animals, mice and guinea pigs are the most highly susceptible species. Anthrax does not spread by contact between living animals.

The U.S. Department of Agriculture's (USDA) main diagnostic laboratories in Ames, IA, the National Veterinary Services Laboratories (NVSL), keep small quantities of anthrax to use as reference material in making confirmatory anthrax diagnoses in animals. USDA's Animal and Plant Health Inspection Service (APHIS) maintains NVSL as part of fulfilling its mission to protect American agriculture.

## Where Anthrax Occurs

Anthrax is endemic to the United States and most other countries of the world, occurring sporadically as environmental conditions allow. In the United States, the Del Rio, TX, region reported ongoing outbreaks of anthrax in deer and livestock this summer. The most recent outbreak there occurred on September 21, 2001. Other recent outbreaks include an outbreak in cattle and horses in Minnesota in June-July 2000; in cattle, horses, and bison in North Dakota in August 2000; and in cattle in Nebraska in January 2001. Similar reports come from other countries that have the necessary environmental conditions and the veterinary infrastructure to be aware of the disease.

## Epidemiology

In order to catch anthrax, animals or humans must be exposed to anthrax spores. The spores may enter the skin through abrasions, be swallowed, or be inhaled. Ruminants are usually infected by ingesting spores from soil-contaminated food or water. The handling of animals or animal products such as hides and wool usually exposes humans. After anthrax spores are ingested they enter the vegetative stage in which they grow and divide. During this stage they travel to, and multiply in, the lymph nodes of susceptible animals. When vegetative cells escape from the animal body and are exposed to oxygen, they form spores. The spores are highly resistant to heat, cold, chemical disinfectants, and drying. Spores are reported to have survived for years in the environment. Environmental persistence may be related to a number of factors, including high levels of soil nitrogen and organic content, alkaline soil (a pH level higher than 6.0), and ambient temperatures higher than 60° Fahrenheit (16° C.)

Anthrax spores may be spread within an area by streams, insects, wild animals and birds, and contamination from body fluids of infected animals. Anthrax may be perpetuated in nature by hosts such as wildlife, which in turn may spill over into the livestock population. When periods of drought cause livestock to forage much closer to the ground, animals may ingest spores in soil they accidentally eat along with forage. In areas where flooding occurs, the concentration of spores caught in standing water increases when preexisting or transitory ponds begin to evaporate. Eroded soil may carry the spores to areas previously not affected. Insects may harbor vegetative anthrax and spread it to animals through their bites or by mechanical transmission.

## Vaccination

Annual vaccination of livestock in endemic anthrax areas is recommended. The most widely used vaccine for the prevention of anthrax in animals is the Sterne-strain vaccine. This vaccine is a non-encapsulated live variant strain of *B. Anthracis* developed by Sterne in 1937. Immunity develops 7-10 days after vaccination. The Sterne anthrax vaccine produced in the United States is licensed for use in livestock (cattle, sheep, horses, goats, and swine) only.

## Vaccination of Pets

No U. S. anthrax vaccine is licensed for use in dogs and cats. Live spore vaccines produced from the Sterne strain in other countries have been used to vaccinate pets and exotic species. However, no safety or efficacy data have been discovered in the literature concerning the use of the livestock vaccine in dogs or cats. Because the livestock vaccine is safe and effective in livestock, most would expect it to be effective in companion animals as well. However, this vaccine contains saponin, a toxic substance, as an adjuvant and its use would be expected to produce severe reactions in dogs and cats at the site of injection.

Human anthrax vaccine was evaluated in monkeys, guinea pigs, and rabbits at the U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID) in the 1960s. The anthrax vaccine licensed for human use in the United States is a killed cell-free filtrate vaccine. No efficacy or safety data have been discovered from experiments in dogs and cats. It is assumed that the human vaccine would be safe in companion animals because it is a nonliving vaccine. However, any conclusions about the efficacy of the human vaccine in companion animals would be speculation. Data are insufficient to provide recommendations to vaccinate dogs and cats for anthrax. APHIS suggests that an informed decision to vaccinate companion animals be based on actual risk. Cases in domestic cats are extremely rare, making vaccination unnecessary. Working dogs might put themselves at risk by exposure to dead carcasses. Dogs respond very well to antibiotic treatment. Search and rescue dogs might be considered for vaccination.

## For More Information

For more information about anthrax, contact USDA, APHIS, Veterinary Services Emergency Programs  
4700 River Road, Unit 41  
Riverdale, MD 20737-1231  
Telephone (301) 734-8073  
Fax (301) 734-7817  
or visit our Web site at [www.aphis.usda.gov/vs/](http://www.aphis.usda.gov/vs/)

## For Public Health Information

For more information on anthrax regarding public health, contact  
Centers for Disease Control and Prevention  
1600 Clifton Road  
Atlanta, GA 30333  
Telephone (404) 639-3311  
or visit their Web site at [www.cdc.gov/](http://www.cdc.gov/)

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