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Anthrax in a Backyard Domestic Dog in Ukraine: A Case Report

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Abstract

Anthrax has been reported in domestic and wild dogs throughout much of the world. Generally, canids are considered resistant to anthrax, although there are several reports of anthrax deaths in both wild and domestic canid populations. Prior to 2012, anthrax had not been reported in dogs in Ukraine, despite a long history in livestock and wildlife. An outbreak involving at least one cow and one dog was reported from a backyard setting in southern Ukraine in August of 2012. Laboratory results and epizootic data were compiled from official investigation reports of regional and state veterinary services involved in the case response. A single dog died after being fed meat and bones from an illegally slaughtered heifer that died of anthrax 5 days earlier. On the evening of the dog's death, the dog refused food or water; however, there were no other clinical signs. Laboratory tests of dog tissue included traditional bacteriology for *Bacillus anthracis,* a small rodent bioassay for virulence, and immunoprecipitation tests (IPT). IPT was positive, viable *B. anthracis* colonies were cultured, and a bioassay confirmed virulence. This was the first confirmed case of canid anthrax in Ukraine. This case report serves to remind veterinary officials that anthrax can affect a wide number of species. We advise surveillance systems remain flexible and include animals that might not otherwise be tested.

Key Words: Dogs—Anthrax—*Bacillus anthracis*—Ukraine—Surveillance.

Introduction

ANTHRAX, CAUSED BY THE SPORE-FORMING bacterium *Bacillus anthracis*, is a zoonotic disease with near worldwide distribution, although its endemic/enzootic distribution is limited by ecological conditions and control efforts. The disease is enzootic in Ukraine, with livestock outbreaks reported nearly annually (Anonymous 2013). The disease is identified primarily in herbivorous livestock with secondary human infections, although there is a growing recognition of the impacts of infection on wildlife. Domestic and wild canids are most likely infected through ingestion of bacteremic carcass meat (Lembo et al. 2011). Dogs (*Canis lupus familiaris*) are generally considered at low risk for developing anthrax following exposure. The clinical presentation in dogs with severe disease is described by ptyalism (hypersalivation) and swelling of the head, neck, and mediastinal regions. When death occurs, it is thought to be due to toxemia and shock, although asphyxia may play a role (McGee et al. 1994, Langston 2005).

The presumptive low mortality and high seroconversion rate in dogs observed in Tanzania led to the suggestion that they may serve as sentinels in cross-sectional serological surveys for livestock anthrax in areas where anthrax surveillance is otherwise challenging (Lembo et al. 2011). To better understand the ecology of anthrax in Ukraine, passive surveillance among domestic livestock has been used for the past century. Here we report the first documented case of dog anthrax in Ukraine, as reported through the national surveillance system.

Case Report

A domestic dog died of anthrax on August 20, 2012, in a backyard setting in southern Ukraine (Voznesenka Village, Melitopol Rayon, Zaporizka Oblast; Fig. 1). The dog was fed meat and bones from an illegally slaughtered heifer that

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FIG. 1. Geographic location of Voznesenka Village, where a domestic dog died of anthrax in eastern Ukraine.

contracted anthrax and had died 5 days earlier on August 15, 2012. That cow had not been vaccinated against anthrax when other cattle in the yard were collected and vaccinated earlier in the year. On the evening prior to its death, the dog refused food or water, but there were no other clinical signs of disease observed. Veterinarians examined the dog and sent the dog's head for laboratory confirmation. The carcass was not opened, as is typical with suspect anthrax cases. Laboratory tests required by Ukrainian regulations included bacteriology, immunoprecipitation tests (IPT), and a small rodent bioassay to confirm virulence. Testing was performed by the nationally delegated diagnostic facilities, the State Regional Diagnostic Laboratory of Veterinary Medicine in Zaporizka. The IPT was positive, and viable *B. anthracis* was cultured from diagnostic specimens. The bioassay confirmed virulence. The remaining 10 cattle in the yard were checked for clinical signs of anthrax and high fever but given clean bills of health. Bedding from the dog's pen was burned in a shallow pit along with the dog carcass 30 meters away from any buildings.

On the basis of archival outbreak data, there is a history of anthrax in this oblast (province) (Shabliy 1979, Anonymous 2013). From 1918 to 2013, 1008 anthrax outbreaks occurred in 310 settlements in Zaporizka Oblast. Domestic cattle made up the majority of registered cases, followed by pigs (22.6%) and horses (14.5%). The earliest reported outbreak in the oblast was in 1918. The earliest reported outbreak in Voznesenka Village, where this dog case occurred, was in 1940. A total of nine livestock outbreaks were reported there from 1940 to 1967. The cow and dog cases reported here are the first confirmed in the village since 1967.

Discussion

This was the first confirmed case of canine anthrax in Ukraine and was notable because it was associated with little clinical evidence of disease with a short time to death (<24 h) from initial signs (refusing food). A more detailed description of pathology was not available because the carcass integrity was maintained instead of performing a necropsy. However, the clinical signs that were observed were consistent with earlier studies (McGee et al. 1994, Langston 2005). Such studies reported that canid infection included generalized congestion as well as multifocal lymphocytic necrosis in the spleen, pulmonary congestion, and hemorrhaging in the gastrointestinal tract. A low incidence of disease in domestic and wild canids has been assumed on the basis of early experimental studies. Initial laboratory data from the 1960s indicated that dogs were resistant to systemic anthrax infection (Gleiser et al. 1968); however, these conclusions were based on experimental respiratory inoculation of dogs with anthrax spores. Field data from the past 30 years indicate that domestic and wild canids can be susceptible to anthrax infection through ingestion of infected carcasses (McGee et al. 1994, Creel et al. 1995), although at the same time serological results suggest canids may be exposed often and have a relatively high resistance (Bellan et al. 2012).

Lembo et al. (2011) suggested that domestic dogs be used as sentinel species to detect anthrax epizootics based on findings that domestic dog anthrax seroprevalence shadowed the levels detected in livestock and wild ungulates in Tanzania. Scavenging infected carcasses has long been considered an incidental source of exposure for carnivores. Additionally, anthrax has been suspected in wild North American wolves (*Canis lupus*) during bison outbreaks (Shury et al. 2009) and confirmed in African wild dogs (*Lycaon pictus*) (Creel et al. 1995). Likewise, black-backed jackals (*Canis mesomelas*) in Namibia (Bellan et al. 2012) and coyotes (*Canis latrans*) in North America (Mongoh et al. 2008) have both been associated with scavenging during anthrax outbreaks. Each of these examples illustrates the importance of considering canids, whether wild or domestic, as potentially susceptible scavengers.

This case report, coupled with recent evidence that canids seroconvert regularly when exposed to anthrax, serves to remind veterinary officials that anthrax can affect and/or be detected in a wide number of species. The death of a dog without significant clinical manifestations and a rapid progression to death suggest a broader understanding of disease susceptibility and progression may be needed. We advise surveillance systems to remain flexible and include animals that might not otherwise be tested because they are not obvious indicator species, including canids and wildlife.

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Author Disclosure Statement

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