Serological detection of infection with canine distemper virus, canine parvovirus and canine adenovirus in communal dogs from Zimbabwe

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Introduction

Dogs are important members of communities throughout sub-Saharan Africa and are the most common carnivore on the continent (Alexander et al. 2010). Dogs thrive in human-dominated ecosystems, and rural villages of Zimbabwe are no exception. It is estimated that over 70% of domestic dogs in Zimbabwe reside on communal lands (Butler & Bingham 2000; Butler, Du Toit & Bingham 2004). The majority of dogs are free-roaming. Most receive little, if any, veterinary care and thus no vaccinations, except periodic rabies vaccination; therefore, life expectancy of these dogs is little more than one year, and over 70% of these dogs die within the first year of life, many due to infectious disease (Butler & Bingham 2000). Nevertheless, these dogs may act as key reservoirs of infectious agents that could infect and cause disease in wildlife (Cleaveland et al. 2006). For example, continued circulation of pathogens such as canine distemper virus (CDV) and canine parvovirus (CPV) provide opportunities for virus exposure to wildlife species, as many of these dogs enter wildlife habitats. It is estimated that over 60% of Zimbabwean nature reserves adjoin communal lands (Butler & Bingham 2000). Some of these encroachments have already led to epidemics of disease amongst wildlife, including African wild dogs and lions (Butler et al. 2004; Gordon & Angrick 1986). The impact of domestic dogs and their diseases on wildlife conservation is increasing in Zimbabwe, necessitating thorough assessment and implementation of control measures (Butler et al. 2004).

Materials and methods

Domestic dogs in north-western Zimbabwe were evaluated for antibodies to CDV, CPV and canine adenovirus (CAV), three important and highly contagious pathogens affecting dogs and wildlife globally. Free-roaming communal dogs residing on rural communal lands in Hwange District bordering both Victoria Falls and Zambezi National Parks were used for this investigation. Sampling was done during periodic cattle dipping at established sites in the region: Chidobe, Kachechete, Donrovon, Chizuma, Breakfast and Woodland. Blood samples \( (n = 225) \) were collected opportunistically from domestic dogs by jugular venipuncture. Sex and approximate age were noted for each animal.

Vaccination for CDV, CPV and CAV (Merial, Atlanta, Georgia, USA) was used as incentive for participation. Serum samples were stored in polypropylene tubes at -20 °C until testing.

Domestic dogs are common amongst communities in sub-Saharan Africa and may serve as important reservoirs for infectious agents that may cause diseases in wildlife. Two agents of concern are canine parvovirus (CPV) and canine distemper virus (CDV), which may infect and cause disease in large carnivore species such as African wild dogs and African lions, respectively. The impact of domestic dogs and their diseases on wildlife conservation is increasing in Zimbabwe, necessitating thorough assessment and implementation of control measures. In this study, domestic dogs in north-western Zimbabwe were evaluated for antibodies to CDV, CPV, and canine adenovirus (CAV). These dogs were communal and had no vaccination history. Two hundred and twenty-five blood samples were collected and tested using a commercial enzyme-linked immunosorbent assay (ELISA) for antibodies to CPV, CDV, and CAV. Of these dogs, 75 (34%) had detectable antibodies to CDV, whilst 191 (84%) had antibodies to CPV. Antibodies to canine adenovirus were present in 28 (13%) dogs. Canine parvovirus had high prevalence in all six geographic areas tested. These results indicate that CPV is circulating widely amongst domestic dogs in the region. In addition, CDV is present at high levels. Both pathogens can infect wildlife species. Efforts for conservation of large carnivores in Zimbabwe must address the role of domestic dogs in disease transmission.
Antibodies to CDV, CPV and CAV were assessed using Biogal Titer Check, according to manufacturer directions (Biogal Laboratory, Kibbutz Galed, Israel). Prevalence estimates were computed and compared across regions and the Simes method was used to adjust for multiple comparisons.

**Results**

Results are presented in Table 1. The majority of dogs tested were male (n = 153; 68%) and young adults (n = 189; 84%). Of these dogs, 75 (34%) had detectable antibodies to CDV, whilst 191 (84%) had antibodies to CPV. Antibodies to CAV were present in 28 (13%) of the dogs. Canine parvovirus had high prevalence in all six geographic areas tested. Two locales, Woodland and Breakfast, had no animals seropositive to CAV, whilst a third, Donrovan, had only one CAV-seropositive dog.

**Discussion**

These results indicate that CPV is widely circulating amongst domestic dogs in the region. In addition, CDV is present at high levels. Both pathogens can infect wildlife species such as African wild dogs, which are endangered, as well as other canid species, hyena and African lions. Previous studies (Prager et al. 2012) have shown that exposure to CDV amongst African wild dogs is associated with unfenced, protected and unprotected areas where contact with domestic dogs is highly probable. Canine parvovirus in particular could pose a threat due to its hardiness in the environment; direct contact is not required and the virus may remain infectious for as long as two years (Van de Bildt et al. 2002). Based on the results of this study, CAV does not appear to be as prevalent amongst the domestic dog population in Zimbabwe.

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