

Serosurvey for canine distemper virus exposure in dogs in communal lands in Zimbabwe

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ABSTRACT

Sera from 173 apparently healthy, unvaccinated dogs from 4 widely separated communal lands in Zimbabwe were tested by ELISA for antibodies against canine distemper virus. Overall, 82 % were positive with high prevalences found in each communal land. The highest seroprevalence was in dogs between 1 and 2 years of age (91 %; 49/54). These results show dogs in the communal lands of Zimbabwe are commonly exposed to canine distemper virus and that a substantial number survive infection. The role that the virus might play in the high mortality rate of the dog population on communal land warrants further investigation.

Key words: communal lands, distemper, serosurvey.

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INTRODUCTION

Most dogs in Zimbabwe live on the communal lands, rural areas where traditional subsistence agro-pastoralism is practiced. They play an important role in communal land life, protecting households against intruders and deterring wildlife species from raiding crops and preying on livestock⁵. The mortality rate in communal land dogs is very high (72 % within the 1st year of life) and life expectancy is low (1.1 years)⁵. Although canine distemper virus (CDV) is known to be an important cause of morbidity and mortality in dogs worldwide¹⁴, there is only limited information on infections in rural dogs in southern Africa. As part of a study of infectious diseases of dogs in the communal lands of Zimbabwe, a previously described ELISA^{3,7,10,15} was used to determine the prevalence of

antibodies against CDV in dogs in 4 widely separated communal lands in Zimbabwe. The findings are recorded in this report.

MATERIALS AND METHODS

Sera

Test sera were obtained from apparently healthy dogs (≥ 20 weeks of age) during rabies vaccination campaign in central [Chinamora (–17.58333S, 31.25000E)], southeast [Chiredzi (–21.00000S, 31.50000E) and Bikita (–20.06667S, 31.60000E)] and northern [Matusadona (–17.08333S, 28.25000E)] Zimbabwe. The age, sex and vaccination history of the dogs were recorded and sera stored at –20 °C until ELISA's were performed. Negative control sera were obtained from 8 crossbreed puppies, 20 weeks of age. These unvaccinated dogs had been reared in a household with no history of canine distemper and the pups had shown no clinical signs of infection. As positive controls, we used sera from 12 dogs that presented to the Veterinary Teaching Hospital of the University of Zimbabwe with clinical and histological evidence of canine distemper virus infection¹⁴.

ELISA for canine antibodies to CDV

ELISAs were performed as described previously³. Briefly, antigens were prepared from a CDV vaccine (Intervet,

Cambridge, UK) by salination to 330 mM and precipitation with polyethylene glycol 6000 (7 %) at 4 °C. Viral proteins were obtained by disruption with freezing and thawing and stripping of the surface proteins with Nonidet P40 (Sigma, Poole, Dorset, UK) (non-ionic detergent). Microtitre ELISA plates were coated with CDV proteins at 10 $\mu\text{g/ml}$ and canine sera (test samples) were added, diluted 1:100 and incubated at 37 °C for 1 hour. Bound antibodies were detected, after washing, with alkaline phosphatase-conjugated rabbit anti-dog IgG (1:1000) (Sigma, Poole, Dorset, UK) followed by the substrate, p-nitrophenyl phosphate (Sigma 104).

RESULTS

Sera

Sera from 173 dogs in the 4 communal lands were tested for CDV antibodies by ELISA (Table 1). Twenty-four dogs were excluded from the study because they had previously been vaccinated with CDV. Almost a third of the dogs sampled (114/173; 66 %) were 2 years old or younger; most dogs were male (100/173; 58 %). Only 7 animals in the study were neutered, all females.

ELISA

Dogs were regarded as having been exposed to CDV if their OD values were greater than the mean OD values of the negative controls plus 2 standard deviations. None of the sera from the negative control dogs had OD values above this level while all positive control sera had OD values at least 30 % above the value (results not shown).

Overall, there was a high prevalence of dogs with evidence of previous exposure to CDV (142/173; 82 %) (Table 2). Seroprevalences in the dogs from the communal lands studied were 74 % (Chinamora), 81 % (Bikita), 83 % (Matusadona) and 89 % (Chiredzi). Although not statistically significant, the highest seroprevalence was in dogs 1 to 2 years of age.

DISCUSSION

The age and sex distributions of the dogs we studied were similar to those

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Table 1: Numbers (percentages) of dogs in various age categories from 4 communal lands in Zimbabwe.

	<i>n</i>	≤1 yr	>1, ≤2 yrs	>2, ≤3 yr	>3, ≤4 yr	>4 yrs
Bikita	42 (24)	14 (33)	17 (41)	4 (10)	5 (12)	2 (5)
Chinamora	38 (22)	16 (42)	5 (13)	9 (24)	5 (13)	3 (8)
Chiredzi	52 (30)	15 (29)	21 (40)	9 (17)	3 (5)	4 (8)
Matusadona	41 (23)	15 (37)	11 (27)	11 (27)	3 (7)	1 (2)
Total	173	60 (35)	54 (31)	33 (19)	16 (9)	10 (6)

Table 2: Ages and percentages (numbers) of dogs found positive by ELISA for antibodies reactive with canine distemper virus.

	<i>n</i>	≤1 yr	>1, ≤2 yr	>2, ≤3 yr	>3, ≤4 yr	>4 yr
Bikita	42	93 (13/14)	77 (13/17)	75 (3/4)	80 (4/5)	50 (1/2)
Chinamora	38	50 (8/16)	100 (5/5)	100 (9/9)	60 (3/5)	100 (3/3)
Chiredzi	52	80 (12/15)	100 (21/21)	78 (7/9)	100 (3/3)	75 (3/4)
Matusadona	41	80 (12/15)	91 (10/11)	82 (9/11)	67 (2/3)	100 (1/1)
Total	173	75 (45/60)	91 (49/54)	85 (28/33)	75 (12/16)	80 (8/10)

previously reported in communal lands in Zimbabwe^{4,5,12}. Of particular note were the low percentages of neutered bitches (4 % in our study and 2 % in a 1986 study⁴) and dogs vaccinated against CDV (12 %; 24/197).

The CDV is a morbillivirus that occurs worldwide and is an important cause of morbidity and mortality in dogs^{1,11}. Clinical signs occur in up to 50 % of infected dogs and commonly include listlessness, anorexia, fever and respiratory, gastrointestinal and neurological signs. Mortality rates are high in dogs that develop clinical signs. Dogs that develop subclinical infections or recover from clinical disease develop high antibody titres that last for long periods of time¹. Various tests are available to detect antibodies to CDV including the virus neutralisation (V-NA), immunofluorescence, haemagglutination inhibition and complement fixation assays^{1,11}. The 'gold standard' is the V-NA² but this assay is expensive, time-consuming, and requires specialised laboratory facilities²⁰. Recently, the more convenient direct ELISA has been shown to be a sensitive and specific test for antibodies against CDV^{9,16,23} and a commercial dot ELISA is available^{21,22}. In our study, we used an ELISA developed in the Department of Immunology, University of Liverpool, which has been used to detect antibodies to CDV in a variety of samples^{3,6,7,15}. As with other ELISAs^{16,22}, results with the test we used have shown good correlation with those obtained with the V-NA³.

Although distemper is regarded as a common disease of dogs in southern Africa¹⁴, there is little published data on the prevalence of infections in the region. In one study, 44 % of rural dogs in Namibia had serological evidence of exposure to CDV¹³ and in another, in a

rural town in South Africa, 6 % of dogs were found with active infections¹⁷. We have now shown that high percentages of dogs (82 %) in widely separated communal lands in Zimbabwe are exposed to CDV. Seroprevalences against CDV have, however, been found to vary from year-to-year in Kenya⁸ and longitudinal studies are indicated to determine if a similar situation occurs in Zimbabwe.

We found the highest seroprevalences in dogs less than 2 years of age, indicating high exposure to CDV. The virus is readily transmitted to susceptible hosts in aerosols and droplets from animals with acute infections. As CDV is very labile and infected animals shed the virus for only short periods, the persistence of CDV in a population requires a constant source of susceptible puppies¹⁴. This seems to be the case in the communal lands where animals are seldom neutered (2–4 %) or vaccinated against CDV (24/197; 12 %).

The dogs we studied were apparently healthy, showing that substantial numbers of dogs infected with CDV in Zimbabwe survive infection. Canine distemper is, however, an important cause of morbidity and mortality in young dogs¹⁴ and it would appear likely that the CDV plays an important role in the high turnover rate reported in communal land dogs in Zimbabwe^{4,5}. *Post mortem* surveys are needed to more precisely establish the role of CDV in these high mortality rates.

Communal lands often border on wildlife reserves and studies have shown CDV can be transmitted from domestic dogs to wild carnivores and result in significant mortality^{8,19}. In a recent study, up to 63 % of free-ranging jackals in Zimbabwe had antibodies to CDV¹⁸ indicating the spread of infection from communal land dogs might also be a risk for wildlife species in the country.

In summary, our study has shown that dogs in the communal lands of Zimbabwe are commonly exposed to CDV and that a substantial number survive infection. Further studies are warranted to investigate the role of CDV in the rapid turnover of communal land dogs, the implications for in-contact wild carnivores and the most appropriate methods to prevent and control infections.

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