

## A DESCRIPTIVE STUDY OF THE CANINE POPULATION IN A RURAL TOWN IN SOUTHERN AFRICA

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### ABSTRACT

The health status of a population of dogs (n=220) from a rural southern African town is described. A cross sectional survey was done to collect the necessary information. All animals examined were mongrels with a mean condition score of 1,93. The oldest dog found in the population was 8 years old. *Rhipicephalus sanguineus* was the dominant tick species encountered on the dogs, *Echidnophaga gallinacea* the dominant flea species, while *Cordylobia anthropophaga* and *Demodex canis* also affected the health status of the population. Fourty five per cent of the population were found to have nematode eggs in the faeces. On clinical examination, 5% of the population were judged to be acutely ill and 27% to be chronically ill. Based on the clinical examination, bloodsmears and laboratory results, 51% of the population had one or more serious clinical conditions at the time of examination. The conditions with the highest point prevalence rate in the community were canine ehrlichiosis (17,2%), transmissible veneral tumour (6,8%), canine distemper (5%), *Cordylobia* infestation (5,5%), trauma (4,1%), and severe malnutrition (4,1%). It was concluded that a significant section of this population was in a chronic state of starvation and malnutrition. There was also a heavy infestation of internal and external parasites and the prevalence of serious diseases in this population was high.

Key words: Canine, disease prevalence, black rural area.

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### INTRODUCTION

The Faculty of Veterinary Science of the Medical University of Southern Africa established a clinic in the rural village of Maboloka in the district of Odi, Bophuthatswana. The housing in the town is of a moderate to low standard with tin shanty houses predominating. There are no formal sanitary services available in the town. Subjective observations suggest that the occurrence or pattern of diseases in dogs in this area is different from that found in more affluent societies. No previous data on mortality, morbidity or disease occurrence in dogs existed for the area. This paper reports

on the results of a cross-sectional survey undertaken in Maboloka.

### MATERIALS AND METHODS

The town Maboloka (25°26'S; 27°51'E) in the district of Odi, Bophuthatswana was divided into 11 sections of more or less equal size. Every fourth house within each section was visited. If the owner consented, one of the dogs of the household was included in the study. Dogs under 3 months of age or with a mass of less than 2,5 kg were excluded from the study, as it was considered deleterious to their general health to collect the amount of blood required for the various diagnostic tests. A total of 220 dogs were sampled, 20 from each section. The size of the dog population was estimated on the results of a mini census which was carried out by counting the dogs of a randomly selected sample of families. The size of the human population was based on the 1985 census results of the Republic of

Bophuthatswana.

An attempt was made to obtain a complete history on the dogs included in the survey. The dogs were weighed and their condition was established by a condition scoring procedure<sup>22</sup>. With this procedure a score of 0 indicates extreme emaciation, while 5 indicates obesity. The age of the dogs were obtained by taking the history or alternately by dental examination.

A full physical examination was performed on each animal and animals were graded as either healthy, acutely ill, chronically ill or weak and disabled.

Blood was collected from all cases and a number of haematological and chemical pathology tests were performed. The methodology used and results obtained have been described<sup>12,13</sup>.

The final diagnosis was based on the results of clinical findings and laboratory results. The disease rate was calculated within the following parameters:

- a. Where cases had more than one distinct clinical condition, all were counted - for example a dog with babesiosis that suffered from a concurrent genital neoplasia would add 2 conditions to the disease rate.
- b. In a case where one condition was judged to be a sequel to the primary disease, only the primary disease would be counted - for example in a case with ehrlichiosis with secondary emaciation, only the ehrlichiosis would be added to the disease rate list.

External parasites were collected from 6 body areas for later identification. These body areas were the eyelids and one cm of skin area around the eyes; the ears, including the base of the ear, the external and internal pinnae and the ear canal; a rectangular area of 10 x 10 cm on the lateral thoracic wall; the 4 feet of the animal from the carpus and tarsus down to the toes; a rectangular area of 10 x 10 cm on the tail-root of the dog, extending from the tail root cranially; and an area of 2 cm on either side of each groin. All the parasites present in these areas were collected except for fleas, of which only a representative sample was taken.

Faecal samples were collected during rectal examination and nematode egg counts were done using the modified

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McMaster technique<sup>5 14</sup>. The faecal examination also included a macroscopic examination for cestode proglottids.

The mean and standard deviations were determined for the recorded parameters and where applicable, the data were tested for normal distribution.

## RESULTS

At the time of the study, the human population of Maboloka was 25 800, the number of houses were 3 583 and there were an estimated 2 329 dogs present in the town. The human to dog ratio was 11,1 to 1 and there were 0,68 dogs per dwelling.

All the animals were mongrels of a mixed genetic background. The sex distribution was 56,4% male, 43,6% female, giving a sex ratio of 1,29 to 1. None of the bitches sampled had been sterilised and only 4 males had been castrated. The mean estimated age of the dogs was 30,8 months with a range of 3 to 96 months. The mean mass of the dogs sampled was 13,2 kg with a range of 2,5 to 45 kg and a standard deviation of 7,19 kg. These data were tested for normal distribution and the test values conformed to a Gaussian distribution by 93,2%. Of the 220 dogs sampled 57,7% were unrestrained, 15,5% were chained for certain periods of time, 25,5% were permanently chained and 1,4% were kept permanently in cages.

It was extremely difficult to obtain any history from the owners or relatives present. Elementary questions about age, appetite and habitus were often answered in vague and inaccurate terms and persistent cross examination would elicit completely different answers to the same question. Even with the unreliable history, it became apparent that only a small proportion of the population had been vaccinated for rabies or distemper.

The mean condition score was 1,93 with a range of 0,5 to 3,5 and a standard deviation of 0,82. Eighteen dogs attained a score of 3,5 which was the highest score awarded, and 16 attained a score of 0,5 which was the lowest score awarded.

On clinical examination alone, 148 dogs (67,3%) were judged to be relatively healthy, 11 (5%) were acutely ill, 60 (27,5%) were chronically ill and one dog was judged to be weak and debilitated due to starvation.

On analysis of the final diagnoses, based on the clinical examination, bloodsmear and laboratory results, 51% (113) of the animals were found to suffer from one or more clinical conditions that were deemed serious enough to require veterinary intervention. A list of the 146 conditions that were diagnosed are presented in Table 1. Parasitic conditions were only included in this list if it was obviously the cause of a state of disease. The total number of ticks collected over

the period was 7 398. Of these, 7 337 (99%) were *Rhipicephalus sanguineus* while *Rhipicephalus appendiculatus* (0,08%), *Amblyomma* species (0,54%) and *Rhipicephalus simus* (0,2%) were also present.

Fleas collected consisted of mixed infestations of *Ctenocephalides felis* (28,4%), *Ctenocephalides canis* (1,9%) and *Echidnophaga gallinacea* (70,2%). A total of 299 fleas were collected. It must be stressed that no attempt was made to collect all fleas seen and only representative samples were taken. *E. gallinacea* was especially plentiful and some animals had massive infestations on the ears and around the eyes.

Other external parasites identified

collected from 209 of the 220 dogs examined. Of these, 95 or 45,5% were positive for nematode ova with the heaviest infestation being 7 500 eggs per gram. Proglottids of *Taenia* species were found in 4 faecal samples, while egg capsules or segments of *Dipylidium caninum* were present in 7 samples. Coccidia oocysts were found in one faecal sample with a count of 900 oocysts per gram.

## DISCUSSION

The human/dog ratio is often used as an indicator of canine over-population. The Maboloka human/dog ratio suggests a relatively low population density when compared to ratios in developed

Table 1: Clinical conditions observed in a canine population in a rural town in southern Africa expressed as the number affected and the point prevalence rate (PPR) per 100 of the population

Conditions	No	PPR
Canine ehrlichiosis	38	17,2
Genital neoplasia		15
<i>Cordylobia</i> infestation		12
Distemper		12
Trauma		9
Emaciation through malnutrition		9
Canine babesiosis		6
Infectious cyclic thrombocytopaenia		5
Demodectic mange		3
Lameness		3
Pyoderma		3
Abscessations		2
Keratitis and blindness		2
Cryptorchidism		2
Flea-bite dermatitis		2
Acute moist dermatitis		2
Canine hepatozoonosis		2
Phymosis and paraphymosis		2
Chronic renal disease		2
Valvular insufficiency		2
Tick toxicosis		1
<i>Stomoxys</i> wounds (extensive)		1
Sinusitis		1
Solar dermatitis		1
Seborrhea sicca		1
Interdigital granuloma		1
Femur fracture		1
Conjunctivitis (primary)		1
Cellulitis		1
Anal gland impaction		1
Other		2
<b>Total</b>	<b>146</b>	

were the lice *Heterodoxus spiniger* (4 dogs) and *Trichodectes canis* (one dog), and the larvae of *Cordylobia anthropopaga* on 12 dogs. Three dogs were infested with *Demodex canis*.

Samples of faeces were successfully

collected from 209 of the 220 dogs examined. Of these, 95 or 45,5% were positive for nematode ova with the heaviest infestation being 7 500 eggs per gram. Proglottids of *Taenia* species were found in 4 faecal samples, while egg capsules or segments of *Dipylidium caninum* were present in 7 samples. Coccidia oocysts were found in one faecal sample with a count of 900 oocysts per gram.

Table 2: Internal parasites identified in a canine population in a rural town in southern Africa

Species	Stools examined	Stools positive	%	Mean eggs per gram
<i>Ancylostoma</i> spp.	209	84	40,2	296,6
<i>Toxocara leonina</i>	209	10	4,8	28,7
<i>Toxocara canis</i>	209	4	1,9	13,4
<i>Taenia</i> spp.	209	4	1,9	-
<i>Dipylidium caninum</i>	209	7	3,3	-

underpopulation that seemed to exist in Maboloka, may be due to the high death rate of especially young puppies in the area. It is obvious, in the light of the freedom of movement and the low sterilisation rate, that it is not due to breeding control.

The fact that 100% of the sample population were of mixed genetic background is probably a reflection of the socio-economic background of the owners. Robinson<sup>16</sup> reported that the proportion of purebred dogs in 4 American states varied from a high 71,4% to a low 36,8%. In a southern African study, 70% of the dogs were found to be purebred<sup>10</sup>. Breed predisposition may well be disregarded as a variant in epidemiological research in this study as this is an exclusive mongrel population.

The sex distribution found in this population is not unlike the findings of other surveys. Robinson<sup>16</sup> surveyed populations with a male to female distribution of 51,8 to 48,2%, 51,1 to 48,9%, 52,7% to 47,3% and 63,6 to 36,4% with the male population more numerous in all the groups. Odendaal<sup>10</sup> reported a ratio of 52% males to 48% females in a survey of 600 dogs in South Africa.

The assessment of age in this survey is in most cases an estimate. Robinson<sup>16</sup> reported a mean age of 56,4 months in the populations he surveyed, with 10,1% of the population over 10 years old. In a southern African survey it was found that 13% of the canine population was over 10 years of age<sup>10</sup>. In Maboloka, no dogs were found to be over 8 years of age and the estimated mean age of 30,8 months compares poorly with the 56,4 months of dogs in North America. The apparent lack of longevity in this dog population may be due to the poor health status and high disease rate.

Dogs under 2,5 kg were excluded from the study, therefore the average mass of 13,2 kg cannot be regarded as representative of the population.

The difficulty in obtaining a history, is mainly ascribed to language difficulties, but disinterest of the owners in the animals as individual pets probably played a role.

The method of condition scoring proved to be an effective way of

eliminating frame size and mass as variables and is reputed to be highly repeatable in production animals<sup>22</sup>. The generally poor body condition of the sample population was clearly caused by a number of factors. An insufficient and imbalanced diet, heavy infestations of internal and external parasites and chronic wasting disease probably all played a role.

The observed disease prevalence was high, even when compared to that of a population of caged, intensively kept dogs<sup>12,13</sup>. Canine ehrlichiosis was the disease with the highest suspected prevalence, but not one diagnosis could be substantiated by the demonstration of morulae in a blood smear. The diagnosis of ehrlichiosis in this study was based on the clinical signs of the disease and the presence of leukopaenia, anaemia and hypergammaglobulinaemia.

The prevalence of genital neoplasia was very high. The tumours seen varied from ulcerating masses of 100 mm in diameter to smaller cauliflower-like growths of 20 mm or more. Most of the tumours resembled the clinical appearance of transmissible venereal tumours (TVT) as described elsewhere<sup>7</sup>. As 5 of the 7 biopsy samples were diagnosed histologically as TVT, it is probable that most of the others that were not biopsied were indeed also TVT lesions. In a survey to establish the incidence of neoplasms, it was found that TVT was the eighteenth most frequent type of tumour encountered and its morbidity in the female genital tract was 15 of a total of 322 neoplasms examined<sup>3</sup>. These observations contrast with those in the present study. Factors that may have played a role in the high prevalence of TVT in Maboloka, could include the relatively closed population and a high population turnover rate, the transmissible nature of TVT and its potential of becoming endemic in an area, the strong demand for puppies and the fact that mating is therefore encouraged, the fact that hardly any dogs in this population are sterilised, and lastly, immunodeficiency caused by endemic parasitism, malnutrition and ehrlichiosis. It has been reported that a possible familial immunodeficiency to TVT may play a role in the incidence of this condition<sup>20</sup>.

The dogs that were diagnosed as suffering from extreme emaciation were free from clinically detectable diseases and it is therefore presumed that malnutrition and verminosis were the main reasons for their debilitated condition. The high prevalence of clinical distemper is to be expected in the Maboloka population because of a rapid turnover of population, unrestrained movement, concomitant diseases and because dogs are rarely vaccinated.

Of the 6 cases with *Babesia* positive blood smears, 2 had low parasitaemias with a relatively normal haematocrit and red cell count. These cases were assessed to be in a premune carrier state. The other 4 cases had low to moderate parasitaemias with low haematocrits and red cell counts and were regarded as acutely ill. In chronic conditions, surveys of this nature detect not only cases of diseases acquired fairly recently, but also those of relatively long duration. Conversely, acute diseases such as babesiosis have less chance of detection and therefore a prevalence rate of 4 cases out of a population of 220 is high. The fact that acute babesiosis is usually fatal if not treated, is an indication that this population probably has a high mortality rate overall. This high mortality rate may have practical implications for animal health officers working in the area. If 220 dogs were to be vaccinated for rabies, for instance, and 4 dogs were to die during the following few days, it is clear that the programme would be discredited. In this respect, vaccinating large numbers of dogs at a central vaccination point would also need to be re-evaluated in view of the high prevalence of contagious diseases within the dog population.

Harvey described a thrombocyte-specific rickettsial micro-organism isolated from a dog which was readily transmitted experimentally to adult dogs by intravenous inoculation of infected blood<sup>8</sup>. He could not establish the natural mode of transmission, but did establish that the dog from which the organism had been isolated, had a heavy tick infestation. A cyclic parasitaemia with a concomitant thrombocytopenia was seen in infected dogs which gave rise to the name infectious cyclic thrombocytopenia. The micro-organisms were ultrastructurally very similar to *Ehrlichia canis*. In the present survey, the blood smears of 4 animals had similar organisms in their thrombocytes, while a further one case was suspicious. All these cases had ticks collected from them, but none could be described as heavily infested if compared to the mean number of ticks (33,4 per animal) collected. Clinically, one of these cases was diagnosed as suffering from chronic

ehrlichiosis while another had a concomitant infection of *Babesia canis*. The other positive cases did not show appreciable signs of ill-health.

The high prevalence of *R. sanguineus* corresponds well with results obtained by Horak<sup>9</sup>. The absence of *Haemaphysalis leachi* in this survey corresponds with a previous finding that this species may be considered to be rare in the central and north-western Transvaal<sup>19</sup>.

The frequency distribution of the flea species identified in the present study differs appreciably from that of other surveys. In an extensive survey in Egypt, *Ctenocephalides felis felis* was the most frequently encountered flea species on dogs, followed by *Pulex irritans* and *Ctenocephalides canis* with only a few *Echidnophaga gallinacea* being encountered<sup>1</sup>. In an Irish study no *E. gallinacea* were found on dogs in the Dublin area and *C. canis* was the dominant species encountered<sup>2</sup>. Guzman<sup>6</sup> also found *C. canis* to be the most frequently encountered flea on dogs in New Zealand, followed by *C. felis felis* and *P. irritans*.

Although only token samples of fleas were collected, it was clear that *E. gallinacea* presented a major problem in the area, clustering together in large groups around the eyes and on the ears of dogs. The preponderance of this species is probably due to the close contact between free-ranging poultry and dogs. Although the burdens of *E. gallinacea* were very large, they did not seem to cause much damage other than superficial wounds. It is known that young chicks are easily killed by these fleas and that even adult birds may succumb to heavy infestations. It is thus probably that these fleas have a deleterious effect on their canine hosts as well, especially in the case of young and weak animals.

Infestation with *Cordylobia anthropophaga* had a high prevalence for a parasite that usually remains on a host for only 8 - 15 d. Some of the dogs had heavy infestations in excess of 50 larvae. Severe infestation seemed to have a deleterious effect on the health of young and small dogs in particular. It is possible that the cause for the high prevalence of this parasite is a combination of the hot climate, coupled with the unhygienic surroundings in which a large percentage of the animals were kept. *Stomoxys calcitrans* bites caused extensive superficial wounds in only one case, but a great number of the dogs had minor wounds that corresponded in appearance to those caused by *Stomoxys*.

There was a high prevalence of ova of *Ancylostoma* spp. when compared with the reported prevalence of 16,5% in the

Pretoria area and 24,3% found in a national survey<sup>21</sup>. Female *Ancylostoma* spp. lay large numbers of eggs and in this survey egg burdens of up to 7 500 eggs per gram were found. Due to a number of factors, however, this study may underestimate the real thread of ancylostomiasis. It has been proven that as high as 65% of the *Ancylostoma* worm burden may be retarded as L 3, and faecal examination fails to reveal their presence in a host<sup>15</sup>. This may have an appreciable influence on the detectable prevalence. This survey was also undertaken during an exceptionally dry year. Hookworm larvae are highly susceptible to desiccation and therefore it is possible that the prevalence of *Ancylostoma* spp. may be even higher after a good rainy season.

It is probable that *Ancylostoma* infestation has a significant influence on the general health and well-being of the canine population of Maboloka and that it seriously affects the survival rate of puppies. Collins<sup>4</sup> stressed the possible effect of nematodes on human health. It is probable that *Ancylostoma* larvae would have an adverse effect on the health of the human inhabitants of Maboloka in view of the unsanitary living conditions prevailing there.

Verster<sup>21</sup> reported a prevalence of 5,5% for *Toxascaris leonina* in dogs examined by her and a prevalence of 3,7% where only stool samples were examined. These results compare well with the findings in this study. The prevalence of *Toxocara canis* was appreciably lower in the present study than the 12,5% prevalence previously reported<sup>21</sup>. It is possible that the prevalence of *Toxocara* spp. was underestimated in the present study, because dogs under 3 months of age were excluded.

Centrifugal flotation with a sugar solution is an effective method of determining the presence of most nematodes. *Spirocerca lupi* is the exception, with poor egg recovery in a sugar solution<sup>15</sup>. Flotation is also unsatisfactory for the detection of cestode infestation. The use of arecoline hydrobromide has been advocated for the collection of faecal samples to identify cestodes<sup>11</sup>. This method is, however, not without risk to the patient and in a survey where the co-operation of the owners of the animals was essential, it was deemed unwise to use this drug. Although no sign of *Echinococcus granulosus* infestation was found in this survey, the presence of this parasite has been firmly established in the general area<sup>21</sup>. It is also probably that the prevalence of *D. caninum* is much higher than may be surmised from the results of this survey.

It is evident that the population described is afflicted by a heavy

infestation of external and internal parasites, a high prevalence of infectious diseases, starvation, malnutrition and a high mortality rate. If the situation in this town is typical of many southern African rural towns, the findings of this survey are a cause for concern. There appears to be a lack of veterinary involvement in the less privileged communities in southern Africa which certainly affects the health status of the canine population, but may also have an impact on the health status of the human population.

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