Chapter 7 Conclusions

The aims of this study were met. The occurrence of helminth parasite infections in dogs from resource-limited communities of Boksburg, Bloemfontein, Jericho, Zuurbekom and Mamelodi were determined and discussed in Chapters 3 - 5. The relative zoonotic potential of each of these species is dependent on whether it is possible to infect humans, how likely it is to infect humans and the numbers of infective stages of these parasites in the environment with which humans may come into contact and become infected. As an example, *T. canis*, which is able to infect humans, will probably come into contact with humans if their dogs harbour egg-producing females. Owners become infected if they handle contaminated soil and place their contaminated hands in their mouths (i.e. eating, etc.). The health status and extent of veterinary care was discussed in Chapter 6, and recommendations for parasite control were discussed throughout this document.

Although most dogs (57%) examined were in a good condition (Condition Score 3 and higher), 43% of the dogs assessed were still regarded as "under condition". For some breeds such as greyhound or collie-type breeds a condition score of 2 may still be acceptable, but the dogs seen in this study were too thin. It was found during the statistical analyses that BCS is more closely related to diet than to infection with the adult stages of intestinal parasites and clinical disease, except in a few extreme cases. In fact, this study showed that intestinal parasite levels bear no direct relation to BCS, and any influence on BCS is probably secondary. Similarly, there was no connection between dog diet and total helminth parasite incidence. In Mamelodi there was

general agreement between owner ESS and dog BCS, which suggest that owners who could afford it, provided more food of a better quality to their animals.

The presence and levels of parasitism of *A. caninum* were high in all the study areas (Table 7.1) and is a concern. In Bloemfontein, the prevalence of *A. caninum* was lower than elsewhere. The differences in micro- and macroclimates between Bloemfontein and Boksburg may explain this lower percentage in the former. The Free State is characterised by colder winters and a drier climate than Gauteng and may therefore not be as suitable for the presence of hookworm. *A. braziliense* was more or less equally represented in both areas, and may be more important as a cause of cutaneous larva migrans in the human population (Miller, 1971). On faecal examination, the prevalence of *Ancylostoma* spp. in the North-West Province and all the Gauteng study areas was found to be in excess of 75%, and 25% in Bloemfontein.

Table 7.1 **Faecal samples of dogs that contained eggs of *Ancylostoma caninum* in the five study areas**

Study area	Percentage (%)
Boksburg	77.4
Jericho	93.3
Zuurbekom	90.3
Mamelodi	82.9
Bloemfontein	25.4
Total	74.2

The common ascarids *T. canis* and *T. leonina* were present in both areas where necropsies were performed (Table 7.2). Both of these ascarids are zoonoses (Verster, 1986) and cause visceral larva migrans, especially in children and people who have contact with soil. Woodruff (1975) quoted that from a total of 800 soil samples from parks and public places in London, 24.4% contained eggs of *Toxocara* spp. Regular contact with *Toxocara* eggs, and if personal hygiene (or rather a lack thereof) permits, this poses a real potential for infection of *Toxocara* in man. Figures of occult human infection found after serological testing of patients in London (quoted by Woodruff, 1975) showed a four-fold increase of *Toxocara* infection in asthmatic patients, a four-fold increase in patients with chorio-retinitis and tumours of the retina and choroid, and a 13 times greater incidence in patients with hepatitis associated with eosinophilia, compared to age-matched controls. Figures quoted by Kinceková et al. (1996) indicated that 13.7% of healthy blood donors in Slovakia and 19% of humans tested in the Czech Republic were serologically positive.

The prevalence of *S. lupi* was similar in both Boksburg and Bloemfontein, which suggest that 13-14% of all dogs in resource-limited communities may be infected. No age predilection for infection with *S. lupi* could be demonstrated statistically, therefore dogs may already be at risk shortly after they reach weaning age. All the cases seen were subclinical, and there was no significant correlation with dog body condition score.

T. vulpis was absent from all the Bloemfontein necropsy samples, but 6% of dogs from Boksburg harboured whipworms. This contributes to our previous understanding

of the distribution of this nematode, which has been reported from KwaZulu-Natal (Reinecke, 1983).

The presence of *D. caninum* and *J. pascualei* was also similar in the two necropsy sampling areas. The prevalence of these cestodes in Boksburg was 39% and 44% respectively, and in Bloemfontein 6% and 5%, respectively. However, there is no reliable, sensitive test available to diagnose infection in the live animal except for treating dogs with a cestocide or laxative and then doing coprological examinations for the recovery of the adult worms. Faecal flotation showed presence of *D. caninum* eggs in a small percentage of cases (6% and 5%, respectively), and adhesive tape swab results (3% in both areas) were unsatisfactory. It seems that for the moment, practitioners will have to rely on occasional reports made by concerned owners of proglottids in their dog's faeces, the presence of proglottids in the faecal samples examined in the clinic, or proglottids seen in the perineal region of the dogs. Only 8% of samples in live dogs were diagnosed positive in this study. This finding is based on a comparison with the actual prevalence from necropsies of dogs from these two areas.

Taenia spp. were higher in prevalence in Bloemfontein than in any of the other study areas. The adhesive tape swab technique was superior to any of the other methods used to diagnose parasitism of these cestodes in the live dog, and it was 88% accurate in this study. This agrees with the findings of Deplazes and Eckert (1988).

Table 7.2 **Comparative summary of the percentage of helminths recovered from dogs from Boksburg (n=69) and Bloemfontein (n=63) during necropsies**

	Boksburg (%)	Bloemfontein (%)
Total dogs	100	100
A. caninum	88	27
A. braziliense	20	19
T. canis	36	21
T. leonina	9	32
S. lupi	14	13
T. vulpis	6	0
D. caninum	39	44
J. pascualei	6	5
Taenia spp.	4	33

There was no significant seasonal influence on the total roundworm burdens of dogs in this study. However, significantly higher incidences of *D. caninum* were found in Boksburg in summer and in *A. caninum* in Bloemfontein in spring.

No significant differences could be demonstrated between anthelmintic treatments given to the dogs by their owners, and helminth eggs found on the faecal flotations. This implies that the worm remedies used were either ineffective, or wrongly applied.

The high levels of parasitism found in dogs of the five study areas are alarming, not only from an animal health point of view, but also from a community health

perspective. Many of the dog parasite species are zoonotic, and there is close contact between the people (especially children) and their animals, which could result in human infections. Most community members are not aware of this. There is a need in the communities for the promotion of knowledge of the dangers of these parasites, and to enable them to control helminths in their animals and the environment through appropriate extension and training.

General recommendations:

Anthelmintic treatment without supportive management strategies is only a short-term solution (Chandler, 1928). In resource-limited communities, helminth control by implementing a sound management policy through education (i.e., awareness and a change of habits if appropriate) will prove to be more practical and cost-effective, and should therefore be the principal route taken. The single most important action, particularly in multi-dog households, is to remove the source of contamination (i.e., dog faeces, to reduce parasite transmission in the environment, especially where roaming or vagrant dogs frequent the area).

In communities where regular municipal waste removal is lacking, the disposal of dog faeces may be a problem. The municipal authorities should also be educated, not only on the dangers of helminth zoonoses, but also on the effects that accumulation of their waste has on human health. Other alternatives to dispose of dog faeces should be investigated (e.g., throwing it into the pit of long-drop toilets, burying or burning).

The dog's everyday habits and what they eat may also have an impact on the levels of parasitism. Roaming dogs may become infected elsewhere and spread the infection in the normal home environment. Some dogs eat dung beetles, frogs, mice, lizards, uncooked chicken, abattoir scraps and carrion and become infected with helminth parasites such as *S. lupi*, ascarids or taeniids. Bitches, after having passed helminth infection to the pups via the milk and through the placenta, may become re-infected with *A. caninum* or *T. canis* when they lick their pups. Dogs may also be infected with taeniids or *D. caninum* after accidental ingestion of flies or fleas.

Deworming and flea control strategies should be aimed particularly at pups and sub-adult dogs, as well as stressed animals (pregnant and lactating bitches, and sick dogs), as they are more sensitive to the effects of parasitism. Personal (washing hands) and kitchen hygiene (washing fruit and vegetables) before eating should become a way of life, and will help with promoting the eating of clean food and a healthy community.

Preventing people from contact with dog faeces is also important. This implies that dogs should be kept away from public parks and playgrounds, people (especially children) should avoid areas where dogs frequently defaecate, and wear protective clothing (e.g., shoes, gardening gloves, etc.) when they are working in the soil.

Resource-limited communities have been living with helminth-infected dogs for centuries. It has probably never been a serious problem in traditional nomadic/pastoral hunter-gatherer communities where fewer animals had more space, as the reinfection rate of their domesticated animals was low. In modern society with its increasing

population numbers and urbanisation, however, there is an ever increasing helminth challenge with increasing helminth levels, and consequently also an increased environmental contamination rate and a threat to public health as a result of zoonoses. As we move into the new millennium, it is unlikely that the human population will benefit and prosper without a thorough knowledge of internal parasites associated with their pets, the zoonotic capabilities of those parasites, as well as the management and therapeutic measures at their disposal to maintain animal- and ultimately also public health. Knowledgeable veterinarians and paraveterinary workers can only impart this knowledge, provided they have motivated community leaders committed to community health, education, development and prosperity.