

Prevalence of Bovine Cysticercosis in the North West Province of South Africa from 2000 to 2010

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ABSTRACT A retrospective study covering the period 2000-2010 was conducted using post mortem meat inspection records of the Provincial Veterinary Department to determine the prevalence, seasonal and sex related variations in the occurrence of *Cysticercus bovis* infections. Records of monthly and annual returns from three randomly selected abattoirs in the Northwest province were examined with regards to total cattle slaughtered and post mortem inspection results. Between 2000 and 2010, a total of 393 858 cattle were slaughtered at the 3 abattoirs. The overall prevalence of *C. bovis* was 0.2 percent. 52 percent of the positive animals were female although the difference was not significant ($p < 0.05$). The prevalence was significantly ($p < 0.05$) higher (0.3 percent) at low through put abattoirs than at high through put abattoirs (0.2 percent). The prevalence reduced slightly from 0.2 to 0.1 percent after 2005 although the decrease was not significant. The dry season also had a non-significantly higher prevalence of 0.2 percent than the 0.1 percent over the wet seasons. Only abattoir type had influence on prevalence, with the low through put abattoirs recording a significantly higher rate.

INTRODUCTION

Bovine cysticercosis (beef measles) is a zoonotic infection of socioeconomic importance caused by the larval stages of *Taenia saginata*, an intestinal cestode of humans that has cattle as intermediate hosts (Boone et al. 2007; Asaava et al. 2009). Globally, there are 77 million human carriers of *Taenia saginata* out of which about 40 percent live in Africa (Megersa et al. 2010). Cattle get measles from humans, so the occurrence of beef measles in cattle would be indicative of a human health problem. In humans, the disease is characterized by lumps in muscles or brain, depending on the type of taenia causing the disease (Hall 1994). Animals infected with measles do not show any signs, such that diagnosis at slaughter remains the cornerstone in the control of *T. saginata* (Dorny and Praet 2007). The presence of measles in a carcass can lead to the condemnation of part or the whole of it.

Surveys of livestock diseases and condemnation rates at slaughter are useful, convenient and inexpensive methods of gathering data on the epidemiology of less acute, chronic, mild and subclinical diseases like bovine cysticercosis (Mallia et al. 2000; Dzoma et al. 2008; Mukaratirwa et al. 2009). The epidemiological data can be used to determine trends in prevalence and significance of disease(s),

thereby informing policy making decisions on disease management (Roberts and Suhardono, 1996). In Southern Africa, surveys on the epidemiology of bovine cysticercosis in cattle have been carried out in Botswana, the Eastern Cape Province of South Africa, Zambia and Zimbabwe among others (Mosienyane 1986; Pugh and Chambers 1989; Giesecke 1997; Dorny et al. 2002). However, despite the huge public health significance of bovine cysticercosis, the vast geographic and cultural diversity among South Africa's provinces, and the huge potential that abattoir generated data has on informing policy formulation and the devising of region specific strategies in disease control, no work has been done in this regard in the North West province. The objectives of this study were therefore to study the epidemiology of bovine cysticercosis based on abattoir records in the North West province of South Africa.

METHODS AND MATERIALS

Slaughter statistics records for the period January 2000 to August 2010 from 3 randomly selected North West province abattoirs were reviewed at the Department of Agriculture, Conservation, Environment and Rural Development (Mafikeng) with respect to *C. bovis* infestations. The abat-

toirs included one each of high throughput (>20 adult cattle/day) and low throughput (<20 adult cattle/day) abattoirs in Ramotshere Moiloa municipality and another high throughput abattoir in the Dr Ruth Segomotsi Mopati District. The catchments of the abattoirs were predominantly commercial farms. At the abattoirs, post-mortem inspections were carried out in line with Food and Agricultural Organisation (FAO) general principles on ante-mortem and post-mortem inspection of food animals (Herenda et al. 2000). Records of monthly and annual returns from the abattoirs were collected and analysed according to the total number of cattle slaughtered, the total number of positive cases, period related distribution, and sex and seasonal distribution of infection. The prevalence (percent) of cysticercosis was computed as the number of positive cases in each case expressed as a percentage of the total number of animal slaughtered for the concerned parameter (Pfukenyi and Mukaratirwa 2004). Statistical analysis was performed using Student's *t*-test for paired observations at $p < 0.05$.

RESULTS

Between 2000 and 2010, 393 858 cattle were slaughtered, 382 077 of which were at high throughput abattoirs while the rest were from low throughput abattoirs. The overall prevalence of bovine cysticercosis was 0.2 percent of the slaughtered cattle (Table 1). The prevalence dropped slightly from 0.2 percent in the first half of the study period (2000-2004) to 0.1 percent in the second half covering the period 2005-2010 although there was no significant ($p < 0.5$) difference. Also, the wet season had a marginally lower prevalence of 0.1 percent compared to the 0.2 percent for the dry season, although again there were no significant ($p < 0.5$) differences. Prevalence in high throughput abattoirs was significantly ($p < 0.5$) lower at 0.2 percent than the 0.3 percent at low throughput abattoirs. On a sex basis, infections were higher in females at 52 percent than the 48 percent for males, although no significant ($p < 0.05$) difference was found. The prevalence of bovine cysticercosis has remained constant at about 0.2 percent since 2000. Only abattoir type had influence on prevalence, with the low throughput abattoirs recording a significantly higher rate of 0.3 percent.

Table 1: The prevalence of bovine cysticercosis in cattle slaughtered at 3 abattoirs in the North West province of South Africa.

Description	Prevalence %
Overall	0.2
1999-2004	0.2 ^a
2005-2010	0.1 ^a
Dry season	0.2 ^a
Wet season	0.1 ^a
High throughput	0.2 ^a
Low throughput	0.3 ^b
Male	48 ^a
Female	52 ^a

a,b Different letters show significant differences between respective paired observations at $p < 0.05$.

DISCUSSION

The current study was based on results from routine meat inspection and slaughter statistics records. Meat inspection remains the cornerstone for the control of *T. saginata* (Dorny and Praet 2007), despite the existence of the more sensitive serologic methods (Dorny et al. 2000). Antigen detection by ELISA has been found to be between 2–10 (Onyango-Abuje et al. 1996; Dorny et al. 2000) and 20 times (Asaava et al. 2009) more sensitive than the routine meat inspection method. However, the meat inspection method remains accessible to all abattoirs regardless of location and resource grounding.

Abattoir records are an inexpensive source of data when recording systems are reliable (Roberts and Suhardono 1996). They further allow studies to involve long study periods, as well as allowing the capture of the real situation on the ground (Dzoma et al. 2008, Mukaratirwa et al. 2009). The overall prevalence of bovine cysticercosis was 0.2 percent. This is similar to official figures derived from meat inspection records in Zambia (Dorny et al. 2002), and closer to the 0.7 percent recorded in Nigeria (Ofukwu et al. 2009). However, the figure is dwarfed by the 1 to 40 percent previously recorded in cattle in Botswana, Kenya, Nigeria, South Africa, Sudan, Tanzania, Uganda and Zimbabwe (Giesecke 1997). Prevalence has been noted to be higher in Eastern African countries (Kebede et al. 2009).

The 0.2 percent in the current study could actually be a gross underestimation of the actual prevalence since the meat inspection methods used at the abattoirs have been found to be 2-20 times less sensitive than serologic methods (Onyango-Abuje et al. 1996; Dorny et al. 2002; Asaava et al. 2009).

Records of the prevalence of this condition in South Africa are quite scarce despite the zoonotic significance of the condition as well as the importance of the cattle industry to the economy of the country. Prevalence rates attributed to a report of workshop by Giesecke (1997) were not readily available, hence a lack of comment in the current study. Apart from the few studies conducted in southern Africa (Mosienyane 1986; Pugh and Chambers 1989; Giesecke 1997; Dorny et al. 2002), the majority of studies have been conducted outside of southern Africa, where prevalence has been regarded as high in East Africa (Kebede et al. 2009). That the South African feedlot industry losses an estimated US\$ 3.300.000 per year as a result of beef measles (Giesecke, 1997) calls for more studies in the epidemiology of bovine cysticercosis.

The factors that have been associated with *C. bovis* include poor hygiene, poverty, increased human-cattle contact such as during drought years, and low awareness levels among communities among others (Cheruiyot and Onyango-Abuje 1984; Mosienyane 1986; Giesecke 1997; Dorny et al. 2000). The low prevalence revealed in this study could point to a minimal presence of factors listed above. Variations in prevalence rates have also been attributed to variations in personal and environmental hygiene, religion, culture and feeding habits of the population and their production systems (Megersa et al. 2010).

High throughput abattoirs recorded a significantly lower prevalence than the low throughput abattoirs. This trend was not easy to explain since some catchments overlapped.

Over the 10 year study period, the prevalence has shown little change, probably indicating stability in the factors that have been listed above as favoring the thriving of bovine cysticercosis.

The wet season also recorded a slightly lower prevalence of 0.1 percent although there was no statistical significance. This was in contrast to the findings of Mosienyane (1986) in Botswana. The current trend could be related to the life cycle of the parasite, where temperature is a major determinant of egg survival in the environment, where they are killed faster at 35°C than at 20°C, and survive for only a few hours whether free or in proglottids at 55°C (Storey 1987). The studied areas of the province have a semi arid climate where temperatures can be high during the dry season. Animals slaughtered during the wet season could most likely have been infected during the dry period when the conditions were not conducive for the survival of the parasite eggs.

In this study, females also showed slightly higher susceptibility than males although not statistically significant. The trend is in contract to that noted by Kebede et al. (2009) and Ofukwu et al. (2009) although they also found the difference to be insignificant. The current findings could be related to beef rearing systems where female animals are used as replacement breeders, and are therefore more likely to stay longer on the farm, hence getting more exposure. However, due to the nature of the study, the age factor was not verifiable.

CONCLUSION

The current study revealed the presence of bovine cysticercosis in some cattle in the North West province, albeit at a low rate of 0.2 percent. Significant differences in prevalence rates were only noted between high and low throughput abattoirs. Awareness needs to be raised among stakeholders, especially the non commercial farming communities with a view of further reducing or eliminating the condition. Further studies are indicated in order to investigate the sources of variances in prevalence rates.

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