Diagnosis of *Taenia saginata* and *T. solium* infections under South African conditions

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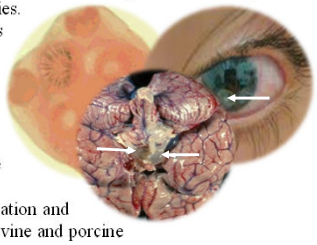
Introduction

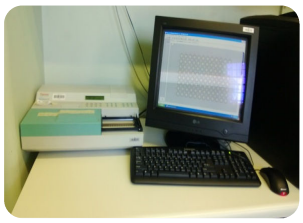
Infection of cattle with cysticerci of *Taenia saginata* or man and pigs with those of *T. solium* causes considerable medical/veterinary and economic problems throughout the world, especially in the less developed countries. The impact of these taeniid species on humans differs, with *T. solium* being the most important as it causes neurocysticercosis, which can be fatal. Furthermore, this parasite can also cause ocular cysticercosis, which might lead to blindness[1]. Clinical effects of cysticercosis on infected cattle and pigs are not significant. It is, however, important with regard to high economic loss due to condemnation and treatment of infected carcasses[2]. Currently, bovine and porcine cysticercosis are mainly diagnosed through meat inspection. Although useful in highly infected carcasses, lightly infected carcasses may easily be missed during this post-slaughter examination and passed on for human consumption. Consequently, the use of meat inspection records tends to underestimate the disease prevalence.



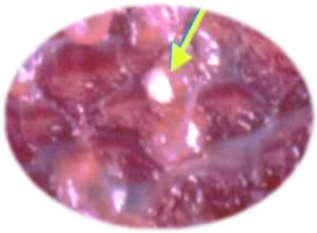
On the other hand, there is a possibility of mistaken identifications during meat inspection, due to cysts having died and degenerated or due to macroscopic morphological similarities in lesions caused by taeniid larvae and other tissue larvae, such as *Sarcocystis* spp.[3] This study therefore aimed at using more sensitive and specific diagnostic methods to diagnose bovine and porcine cysticercosis.

Materials & Methods

Blood samples were collected from cattle and pigs brought for slaughter at abattoirs in the Free State and Gauteng Provinces. Serum samples were harvested from the collected blood and analysed, using a monoclonal antibody based (HP10) antigen detecting ELISA[4]. This assay is specific for *T. saginata* and *T. solium* infections in both humans and animals and has been shown to be more sensitive than meat inspection.



The cut off point was calculated, using the formula: Cut off point = 2X + 3sd, where X = mean; sd = standard deviation from the mean. Cyst samples were collected from infected carcasses by meat inspectors and preserved in 70% ethanol. Subsequently, genomic DNA was extracted and PCR conducted, using Tsag-cox1 (F3+B3) and Tsol-cox1 (F3+B3) primer sets to respectively confirm identifications of *T. saginata* and T. *solium* metacestodes[5].



Results

Table 1: Prevalence of cysticercosis in cattle and pigs brought for slaughter at abattoirs

Abattoirs	Throughput	n (cattle; pigs)	Prevalence[a]	Prevalence[b]
A	High	94	13%	0.2%
B	Low	138	30%	0%
C	Low	33	48%	0%
D	High	102	11%	0%
E	High	168	23%	1.2%
F	High	29; 173	7%; 37%	0%
G	Low	15	20%	0%
H	Low	101	28%	0.54%
I	High	131	40%	0%
J	High	120	18%	0%
K	High	73	8%	0%
L	Low	70	4%	0.4%
M	High	177	3%	0%
TOTAL		**1000; 424**	**16%; 32%**	**0.18%**

[a]seroprevalence; [b]based on meat inspection

About 97% (n=143/147) and 100% (n=1/1) of cysts identified as *T. saginata* and *T. solium* cysticerci respectively during meat inspection were subsequently confirmed through PCR (Figure 1).

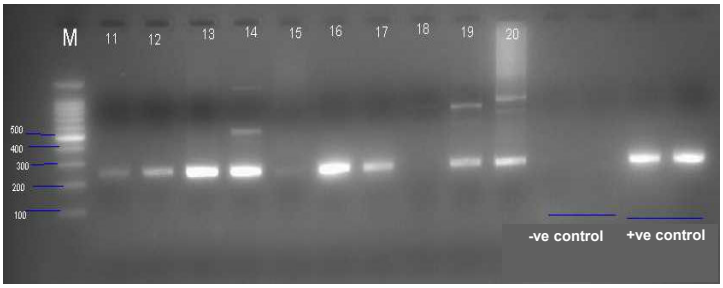


Figure 1: Detection of the cox1 gene in *Taenia saginata* cysticerci

Conclusions

The study showed that ELISA is more sensitive than meat inspection and can detect both *T. saginata* and *T. solium* before slaughter. However, it is genus specific, hence cannot differentiate between the two taeniids. On the other hand, the PCR assay used in this study proved to be species specific, however it is currently suitable as meat inspection confirmatory test only, and does not avert financial loss caused by condemnation/treatment of carcasses found to be infected after slaughter. An *antemortem* and species specific assay that can distinguish between these two parasites still needs to be developed, since their impact on humans differs greatly.

Bibliography

[1]Flisser et al., 2002. *Life and Behavioural Sciences*, 341, IOS Press, Amsterdam, pp. 335-342. [2]Murrel et al., 2005, Guidelines for the surveillance, prevention and control of taeniosis/cysticercosis. *WHO/FAO/OIE*. [3]Gonzalez et al., 2006. *Veterinary Parasitology*, 142: 95-101. [4]Harrison et al., 1989. *Parasite Immunology*, 11: 351-370. [5]Nkouawa et al., 2009. *Journal of Clinical Microbiology*, 47: 168-174.

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