Trop Anim Health Prod (2009) 41:291–294
DOI 10.1007/s11250-008-9188-4

ORIGINAL PAPER

Current status of bovine cysticercosis of slaughtered cattle in Addis Ababa Abattoir, Ethiopia

Nigatu Kebede · Getachew Tilahun · Asrat Hailu

Received: 13 May 2008 / Accepted: 21 May 2008 / Published online: 13 June 2008

Abstract The prevalence of *Taenia saginata* cysticercosis in cattle slaughtered for meat in Addis Ababa Abattoir, Ethiopia between September 2004 and August 2005 was reported. The examination of various organs of 11227 cattle in Addis Ababa Abattoir showed that 842 (7.5%) were infected with *T. saginata* cysticercosis. The tongue, masseter muscles, cardiac muscles, triceps muscles and thigh muscles were the main predilection sites of the cysts. The cysts of bovine cysticercosis were also identified on the spleen, intercostal muscles, diaphragm and liver. Out of 10329 male cattle, examined, 783 (7.6%) had cysts of bovine cysticercosis while 59 (6.6%) of the 898 female animals investigated were infected. The animals slaughtered were all adults. No significant difference in prevalence rates was recorded between the sexes. The prevalence of bovine cysticercosis was higher in local zebu cattle breeds than Holstein-Frisian cattle.

Keywords *Taenia saginata* · Bovine cysticercosis · Cattle · Prevalence · Ethiopia

N. Kebede (✉) · G. Tilahun
Aklilu Lemma Institute of Pathobiology,
Addis Ababa University,
P.O. Box, 56478, Addis Ababa, Ethiopia
e-mail: nigatukebede@yahoo.com

A. Hailu
Department of Microbiology,
Immunology and Parasitology (DMIP),
Faculty of Medicine, Addis Ababa University,
Addis Ababa, Ethiopia

Introduction

The occurrence of the larvae of *Taenia saginata (T. saginata)* in cattle musculature causes *T. saginata* cysticercosis or bovine cysticercosis while the adult worms in human small intestines cause taeniasis (Neva and Brown 1994; Carpio 2002). In humans, *T. saginata* infestation is accompanied with mild symptoms ranging from nausea, abdominal discomfort, epigastric pain, diarrhea, vitamin deficiency, excessive appetite or loss of appetite, weakness and loss of weight to digestive disturbances and intestinal blockage (Neva and Brown 1994). However, in cattle, heavy infestation by *T. saginata* cysticercosis may cause myocarditis or heart failure (Gracey and Collins 1992). The life cycle and transmission of the parasite occur most commonly in environments characterized by poor sanitation, primitive livestock husbandry practices, and inadequate meat inspection, management and control policies (Mann 1983; Phiri et al. 2003).The life cycle of the parasite, *Taenia saginata*, involves humans and cattle the final and intermediate hosts respectively (Lees et al. 2002).

T. saginata cysticercosis is found almost all over the world, albeit at very low prevalence in developed countries. Moderate prevalence levels are seen in southern Asia. High prevalence rates occur in Sub-Saharan Africa, especially in Eastern Africa where it causes an important economic loss due to condemnation of meat (Cabaret et al. 2002). In Ethiopia, reported prevalence rates of bovine cysticercosis in cattle ranged from 2.2% to 3.2% (Teka 1997).

Bovine cysticercosis is one of those animal health problems that reduce export earnings of the country (EARO 2000). It is, therefore, important that due attention be given to this disease to improve the quality and quantity of beef so as to satisfy the domestic consumption and to increase the foreign export revenue. The aim of this study was to know the current prevalence of bovine cysticercosis in cattle using the conventional parasitological methods at Addis Ababa Abattoir, Ethiopia.

Materials and methods

Study area

The study was conducted in Addis Ababa Abattoir. At Addis Ababa Abattoir cattle, sheep, goats and swine are slaughtered and animals for slaughter come from different regions of the country. Daily 700 cattle, 250 sheep, and 75 goats are slaughtered. About 50 pigs are slaughtered per week and the sources of pigs are Addis Ababa, Debre Zeit and Zeway farms. On average 153,000 cattle, 39000 sheep, 3200 goats and 750 pigs are slaughtered annually (DoA 2006). The Abattoir provides fresh meat for different Institutions such as hotels, hospitals and butcheries. The Ministry of Agriculture and Rural Development (MoARD) conducts the meat inspection procedure.

Study animals

Postmortem inspection was conducted on 11227 cattle slaughtered at Addis Ababa Abattoir, which originate from neighboring localities and/or regions such as Orromia, Amhara, Souther Nation and Nationalities etc. Of the animals slaughtered 2500 were Holstein-Frisian cattle breeds culled due to various problems from dairy farms where as the remaining 8727 were local zebu cattle breeds. Particular attention was given to factors such as sex, age, and origin of the animals.

Postmortem inspection

Postmortem examinations were carried out in Addis Ababa Abattoir on randomly selected 11227 slaughtered cattle, between September 2004 and August 2005. Carcasses of these animals were thoroughly inspected; incisions and inspection were done following the methods earlier described (MoA 1972; Okafor 1988; Anosike 2001). In the abattoir both exotic and local zebu cattle breeds were slaughtered. The abattoir was visited three days in a week and was such that the butchers were met in the afternoon while bringing their animals to the abattoir for slaughter. This was done to determine the age and sex of each animal slaughtered. The diaphragm, triceps, thigh muscles, masseter muscle, heart muscle, intercostal muscles, lungs, liver, tongue, kidney, intestinal mucosa and spleen of 11227 cattle slaughtered during the study period were examined for bovine cysticercosis. During the routine meat inspection of these organs one or more incisions were made. The cysts observed were categorized into live and calcified cysts. The cysts were carefully dissected from the tissues and the number in each organ recorded for each animal. At the end of the examination, the cysts collected were taken to the laboratory for further diagnosis following the procedures already reported (Petrovic 1976). The cysts were released using bovine bile or pepsin, usually occurred within 30 to 60 min. The cysts were then identified as *T. saginata* cysticercosis if there were no hooks on the evaginated scolex (Okafor 1988; Opara et al. 2006).

Statistical analysis

The occurrence of bovine cysticercosis was calculated by dividing the number of animals harboring a cyst by the total number of animals examined. Percentages (%) to measure occurrence and chi-square ($\chi 2$) to measure association were the statistical tools applied.

Results

All the cattle slaughtered in the Addis Ababa Abattoir were adults. Of the total 11227 animals inspected, 842

Table 1 The prevalence of *T. saginata* cysticercosis infection of cattle in Addis Ababa Abattoir

Cattle breed	No. examined	No. (%) infected
Local zebu cattle	8727	740(8.5)
Holstein-Frisian cattle	2500	102(4.1)
Total	11227	842(7.5)

Table 2 Sex distribution of bovine cysticercosis infection of cattle in Addis Ababa Abattoir

Sex	No. examined	No. (%) infected
Male	10329	783(7.6%)
Female	898	59(6.6%)
Total	11227	842(7.5)

P>0.05

Table 3 Predilection sites of bovine cysticercosis cysts in slaughtered cattle in Addis Ababa Abattoir

Predilection sites	No (%) Infected
Masseter muscles	308 (36.6)
Tongue	300 (35.6)
Heart muscles	294 (34.9)
Triceps	281(33.4)
Thigh muscles	101(11.9)
Diaphragm	94(11.2)
Liver	23(2.7)
Intercostals muscles	12 (1.4)
Spleen	8 (0.9)
Intestinal mucosa	1 (0.1)

animals were positive for bovine cysticercosis. The prevalence of bovine cysticercosis was 7.5%. The prevalence between Holstein-Frisian cattle breeds and local zebu cattle breeds were described (Table 1).

The sex distribution of *T. saginata* cysticercosis infection of cattle was described (Table 2). Of the 11227 cattle examined, 92.06% were adult males. Although more males than females were examined, the prevalence of infection did not show any significant difference ($P>0.05$).

On the predilection sites of the cysts 36.6%, 35.6%, 34.9% and 33.4%, of the cysts were collected from the masseter muscles, tongue, heart muscles and triceps muscles respectively. Infection was also recorded from the liver (2.7%), inercostal musceles (1.4%), spleen (0.9%) and intestinal mucosa (0.1%). Bovine cysticercosis was not found in the lungs and kidney (Table 3). The distribution and condition of bovine cysticercosis in slaughtered cattle in Addis Ababa Abattoir, Ethiopia was described (Table 4). The cysts of bovine cysticercosis found in the spleen, intercostal muscles and intestinal mucosa were all live while those in the liver 4 were live and 19 were dead. Both live and dead cysts of bovine cysticercosis were found also in other organs inspected.

Discussion

During the present study period, we found that 7.5% of cattle presented for slaughter at Addis Ababa Abattoir, Ethiopia harbored bovine cysticercosis. Previous prevalence rates in Addis Ababa Abattoir, based on routine meat inspection, ranged from 2.2 to 3.2% (Teka 1997). We believe that this is due to the inefficiency of the conventional method of inspection.

Table 4 Distribution and condition of the cysts of bovine cysticercosis in 842 infected slaughtered cattle in Addis Ababa Abattoir

Live cyst		Calcified cyst		Live & Calcified cyst	
No. cyst/animal	No. animals	No. cyst/animal	No. animals	No. cyst/animal	No. animals
1–5	155	1–5	19	1–5	12
6–10	149	6–10	83	6–10	4
11–15	129	11–15	28	11–15	1
16–20	107	16–20	–	16–20	1
21–25	101	21–25	–	21–25	—
Above 25	63	Above 25	–	Above 25	—
Total	704	Total	120	Total	18

Cysticerci are easily missed, as they may not be present on routine cuts considering that most cases of cysticercosis are light infections. Moreover, observations indicated that except for the dead, degenerate or calcified cysticerci that usually form white and fibrotic lesions a careless meat inspector could most likely miss out quite a number of viable cysticerci, which blend the pinkish-red colour of the meat and be passed on for human consumption. Differences in the skills and motivation of meat inspectors, the speed of the slaughter activity, and the meat inspection facilities, are among the many other contributory factors.

Our observations showed that the masseter muscles, tongue, heart muscles, triceps muscles and thigh muscles among others were the preferred organs (predilection sites) for the cysts of bovine cysticercosis similar to earlier reports in various endemic areas (Okafor 1988; Pawlowski and Schultz 1992; Opara et al. 2006). It appears that several factors, such as activity of the muscles, age, and the geographical area concerned determine largely the predilection sites in slaughtered cattle (Petrovic 1976; Opara et al. 2006). It was observed that some live cysts were isolated from the intercostal muscles, spleen, liver, intestinal mucosa but not from the kidneys and lungs. Sex-related distribution of bovine cysticercosis infection of the slaughtered cattle in this study showed that sex of the animals and infection were independent. Though more males than females were infected, it could be related to the sample size and not sex. Since the animals slaughtered were all adults it was not possible to compare the relationship of prevalence with the ages of the animals. Breed related distribution of bovine cysticercosis indicated higher prevalence (8.5%) in local zebu cattle breeds than Holstein-Frisian cattle (4.1%). This is may be associated with management system where Holstein-Frisian cattle breeds were from dairy farms having less exposure to contaminated pasture with human excreta while the local zebu cattle breeds were from fattening or extensive management system.

In Ethiopia bush defecation, the habit of eating raw beef dishes such as *kitfo* and *kourt* and backyard slaughter might have contributed for the high prevalence of bovine cysticercosis in cattle. Therefore, to reduce the transmission of taeniasis/ bovine cysticercosis, public education to avoid consumption of raw meat, and use of latrines and improved standards of human hygiene were recommended.

Acknowledgments The author would like to acknowledge staff members of Addis Ababa Abattoir for their technical assistance. Financial support was obtained from Research and Graduate studies of the Addis Ababa University.

References

Anosike, J. C., 2001. Some observations on *Taenia saginata* cysticercosis in slaughter cattle in Nigeria. Int. J. Zoonoses **2:** 82–89.

Cabaret J., Geerts S., Madeline M., Ballandonne C., Barbier D., 2002. The use of urban sewage sludge on pastures: The cysticercosis threat. *Vet. Res*. **33**: 575–597 DOI 10.1051/vetres:2002040

Carpio, A., 2002. Neurocysticercosis: an update. Lancet Infect Dis 2: 751–762 DOI 10.1016/S1473–3099(02)00454–1

Department of Agriculture (DoA) for Addis Ababa region, 2006. Annual report for department of agriculture, 2006.

Ethiopian Agricultiral Research Organization (EARO), 2000. Beef Research Strategy. Ethiopian Agricultural Research Organization, Animal Science Directorate, Addis Ababa, pp, 1–16.

Gracey, F. J. and Collins, S. D., 1992. Meat hygiene. 5th ed. Baillière Tindall, 24–28 Oval Road, London NW17DX: pp. 413–420.

Lees, W., Nightingale, J., Brown, D., Scandrett, B., Gajadhar, A., 2002. Outbreak of *Cysticercus bovis* (*Taenia saginata*) in feedlot cattle in Alberta. *Can Vet J 43*: 227–228.

Mann I., 1983. Environmental, hygiene and sanitation based on the concept of primary health care as a tool for surveillance, prevention and control of taeniasis/cysticercosis. *Curr Publi Heal Res Trop*. 36:127–140.

Ministry of Agriculture (MoA), 1972. Meat Inspection Regulations. Legal Notice No-428. Negarit Gazeta. Addis Ababa, Ethiopia.

Neva, A. F., Brown, W.H., 1994. Basic clinical parasitology. 6th ed. Prentice - Hall International Inc. pp. 181–200.

Okafor, F.C., 1988. Epizootiology of Cysticercus bovis in Imo State, Nigeria. Angew. Parasitol. **29:** 25–30.

Opara, M. N., Ukpong, U. M., Okoli, I. C., Anosike, J. C., 2006. Cysticercosis of Slaughtered Cattle in Southeastern Nigeria. Ann. N.Y. Acad. Sci. 1081: 339–346 DOI 10.1196/annals.1373.048

Pawlowski, Z.S. and Schultz, M.G., 1992. Taeniasis and Cysticercosis (*Taenia saginata*). Adv. Parasitol. **10:** 269–273. DOI 10.1016/S0065–308X(08)60176–1

Petrovic, A.P., 1976. On the incidence of *Cysticercus bovis* in Tanzania. Vet. Glesnik. **30:** 709–713.

Phiri, I.K., Ngowi, H., Afonso, S., Matenga, E., Boa, M., Mukaratirwa, S., Githigia, S., Saimo, M., Sikasunge, C., Maingi, N., Lubega, G.W., Kassuku, A., Michael, L., Siziya, S., Krecek, R.C., Noormahomed, E., Vilhena, M., Dorny, P., Willingham, A.L., 2003. The emergence of *Taenia solium* cysticercosis in Eastern and Southern Africa as a serious agricultural problem and public health risk. Acta Trop 87:13–23.

Teka, G., 1997. Food Hygiene Principles and Food Borne Disease Control with Special Reference to Ethiopia. 1st ed. Faculty of Medicine, Department of Community Health, Addis Ababa University, pp, 40–62.