

## TAENIA SAGINATA IN MAN AND CYSTICERCOSIS IN CATTLE AND BUFFALOES IN ASWAN GOVERNORATE, EGYPT

By

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### Abstract

Taeniasis is an important foodborne parasitic disease worldwide. This study determined the presence of cysticercosis in cattle and buffaloes and discussing their public health importance in Aswan Governorate, Upper Egypt. A total number of 45780 cattle, 223 buffaloes, were examined during the extended period from August 2015 till the end of July 2016. The existence of *Cysticercus bovis* infection among slaughtered Cattle and Buffaloes was studied at three different slaughterhouses (Aswan, Draw and Al-Sharq Al-Awsat) in Aswan Governorate. *C. bovis* in slaughtered cattle and buffaloes was (7.5% & 1.34%), respectively. Cattle and buffaloes infected with *C. bovis* it was for young and old animals, respectively (7.5% & 12.12%); (0.51% & (7.14%). *C. bovis* in slaughtered cattle was commonly found in the tongue muscles (70.46%), Heart (2.8%), masseter muscles (0.43%) and gluteal muscles (0.29%). While for buffaloes heart (100%) was the most common site infected with *C. bovis*. Moreover, Viable *C. bovis* was (86%) in slaughtered cattle and buffaloes.

Taeniasis was detected in (0.4%) of examined patients with gastroenteritis. The infection among male is (1.5%) while it not detected in females. The results confirmed that cysticercosis is endemic among cattle and buffaloes in Aswan Governorate. Meat inspection is a must.

**Keywords:** Egypt, Aswan, Foodborne parasite, Cysticercosis, Taeniasis, Zoonosis

### Introduction

*Taenia saginata* or beef tapeworm is one of the main sources of infection worldwide causing anorexia, weight loss, abdominal pain and digestive upset (Andreassen, 1998). The economic significance of *C. bovis* in the livestock industry may be considerable mainly in developing countries. The downgrading and condemnation of the carcasses leads to substantial loss in livestock industry. Cattle and buffaloes represent the main reservoirs for zoonosis *T. saginata* (Hughes *et al*, 1993), affecting animal wealth, especially cattle, main source of meat, milk and hides in one of great economic importance. The parasitic diseases of humans and livestock are ubiquitous in the developing world and have substantial impacts on human welfare. For the estimated one billion people living in poverty who rely on livestock for their livelihoods, parasites steal valuable meat and its products resources by multiple pathways. This diversion of nutrients ultimately contributes to chronic malnutrition, greater

human disease burdens and decreased productivity of livestock (Rist *et al*, 2015). Parasitic food borne diseases remain a major health problem affecting man and animals, particularly in the tropical and sub-tropical countries (Tagboto and Twonson, 2001).

Animal production is one of the vital sources of national income worldwide. In Egypt, with the rapid increased human population meat is the commonest animal protein for human consumption, so it should be parasites-free. The *Cysticercus bovis* within different tissues of cattle causes economic loss in the carcasses and threaten human health. *T. saginata* cysticercosis is one of the zoonotic parasites. It may be subjected to freezing in localized infection cases or total condemnation of carcasses and offal in generalized ones (Rossi *et al*, 2016). Requirements to increase demand of animal protein, which in turn based on raising buffaloes, cattle, camel, sheep and goats for meat and milk production. Such animals may suffer from parasitosis affecting their lives and/or

production, either through direct or indirect adverse (Theodoropolous *et al*, 2002).

This study aimed to evaluate cysticercosis in cattle and buffaloes and to study morphologic characters of *Cysticercus bovis* and its effect on the tissue and investigate the zoonotic taeniasis in Aswan Governorate, Upper Egypt.

### Materials and Methods

**Locality:** This is a descriptive study was carried out at three different slaughterhouses (Aswan city, Draw city and Al-Sharq Al Awsat in Abu-Simbuel Region) in Aswan Governorate, southern Egypt, during the period from August, 2015 to July 2016, to detect zoonotic taeniasis in Aswan Central Hospital.

**Slaughtered animals:** A total of 45780 cattle and 223 buffaloes slaughtered animals comprising from records of meat inspection in slaughterhouses were examined for the existence of larval stages. The slaughtered animals of different sex were considered as young below two years old, while adult above two years old. Imported animals were coming from Sudan. Moreover, seasonal variation was recorded.

**Samples collection and postmortem examination:** Routine post mortem inspection to heart, tongue diaphragm, liver, kidneys, lung, esophagus, and masseter muscles as well as shoulder muscles and inspection to gluteal, omentum, mesentery. Cysts were carefully removed from condemned organs without injuries to their walls. All *C. bovis* were collected in separate labeled bags kept in an ice box container and transported to the Parasitology Department, Aswan Faculty of Veterinary Medicine.

**Macroscopic examination and fertility of *C. bovis*:** Cysts were macroscopically examined and classified as viable or degenerating after fingers pressing. Translucent, fluid filled bladder viable cysts were considered mature when contained protoscolex. Those without a distinct protoscolex were immature. Degenerating cysts were classified as calcified when their contents were solid, as

cheesy when smooth, or dull when they contained nothing and were apparently neither viable nor degenerating for criteria of viable cyst (Fahmy *et al*, 2015). *C. bovis* was microscopically examined fixation and stained with acetic acid alum carmine stain and/or hematoxylin and eosin (Bancroft and Gamble, 1997). SEM of cysts was done after Bozzola and Russell (1991).

**Detection of taeniasis in human:** Stool samples were collected from 325 patients males and 124 females suffering from gastrointestinal disturbances, who attended Aswan Central Hospital. Each sample (10g) was collected in clean labeled plastic container with Snap-on lids and transported to Department of Parasitology, Aswan Faculty of Medicine. Samples were fixed in 10% formalin saline solution in a ratio of 3:1 part farces and stored in labeled vials at room temperature until examination. Stool samples were examined microscopically by direct smear and simple sedimentation techniques (Urquhart *et al*, 1994).

**Statistical analysis:** Data were tabulated, computerized and analyzed using SPSS (Statistical Package for Social Science) program for statistical analysis. Data were entered as numerical or categorical, as appropriate. Two types were used: Descriptive statistics: Qualitative data were expressed as frequency and percent at 95% confidence interval (95% CI). Analytical statistics: Chi-square test was used to measure the association between qualitative variables. P value was significance if less than 0.05.

### Results

In the present study, taeniasis was among 325(0.4%) among patients examined by sedimentation technique. *Cysticercus bovis* in slaughtered animals was (7.5% & 1.34%) among cattle and buffaloes, respectively. *C. bovis* was (7.5% & 12.12%) and (0.51% & 7.14%) in young and old animals, respectively. The highest *C. bovis* infection in cattle and buffaloes was during winter (9.4% & 4.25%) respectively. In cattle, tongue,

heart, masseter muscles and gluteal muscle were *C. bovis* the most predilection organs, but in buffaloes was found only in the heart. In the present study, macroscopically *C. bovis* was small, pea-sized oval in shape, translucent with a single white scolex about 1.0cm in diameter, and filled with clear fluid. Details are given in figures (1, 2, 3, 4, 5 & 6).

### Discussion

In the present work, taeniasis among 325 patients was (0.6%), which was lower than 0.75% reported in Mexico (Martinez-Maya *et al*, 2003) and in Turkey (Culha, 2006). The differences may be due to study location, personal hygiene, educational level, and eradication programs. The infection rate was (1.6%) in males, but none in females. In Egypt, *Taenia saginata* was among the commonest intestinal parasites that caused chronic digestive disorders as persistent diarrhea, chronic abdominal pain and/or blood in the stool (Omran and Mohammad, 2015).

In the present study, *C. bovis* was 3433/45780 (7.5%) among cattle at three different slaughterhouses in Aswan Governorate. This agreed with Elkhtam *et al*. (2016) reported 6.09% in Menofia Governorate, as well as abroad in Brazil, (Almeida *et al*, 2002), Vietnam (Van De *et al*, 2014) in 23 European countries (Laranjo-González *et al*, 2016), and in Ethiopia (Engdaw *et al*, 2015; Wondimagegnei and Belete, 2015; Jemal and Kebede, 2016), however, Dada (1980) reported 0.9% in Sudan. These data were higher than that 2.16% in Zimbabwe (Pugh and chambers, 1989; Phiri, 2006) in Zambia and by Abu-Elwafa and Al-Araby (2008), Basem *et al*. (2009) in Egypt, Ofukwu *et al*. (2009), Rabi'u and Jegede (2010), Ngwu *et al*. (2004) in Nigeria, Kozłowska-Łój (2012) in Poland, Dupuy *et al*. (2014) in France, Dorny *et al*. (2009) in Belgium and Rossi *et al*. (2016) in Brazil. On the contrary, the present data was lower than (20%), reported by Abdel-Hafeez *et al*. (2015) in Egypt, Mosienyane (1986) in Botswana, Kebede (2008), and Abunna *et al*. (2008) in Ethio-

pia. In the present study, *C. bovis* was in (9.3%) imported cattle and (0.37%) indigenous ones. This agreed with Haridy *et al*. (1999) in Egypt and Opara *et al*. (2006) in Nigeria. The lower prevalence of cysticercosis in indigenous ones might be due to continuous activities the Egyptian Veterinary Medical Authorities.

In the present study, in buffaloes *C. bovis* was 223(1.34%). This more or less agreed with (0.8%) in Assiut Governorate (Basem *et al*, 2009), and more than (0.14%) in Greater Cairo Governmental Slaughterhouse (Haridy *et al*, 1999) and in India Pramanik *et al*. (1984).

*C. bovis* in cattle and buffaloes varied were (7.46% & 0.97%) in males and (17.7% & 5.5%) in females, with significant differences among sex of cattle and buffaloes ( $P < 0.05$ ). As to ages, cysticercosis in cattle and buffaloes above 2 years old animals were higher and then less than 2 years. This agreed with Pramanik *et al*. (1984), Okolo (1986), Dorny *et al*. (2000), Basem *et al*. (2009) and Opara *et al*. (2006). The highest infection of *C. bovis* in cattle and buffaloes was during winter (9.4% & 4.25%), which in cattle began to decline slightly in spring (8.9%), followed by summer and autumn (6.02% & 5.25%) respectively, but without significant differences ( $P > 0.05$ ). Seasonal variation might be due to blood kinetics and daily activities, the environmental factors affect blood kinetics that affect onchosphere distribution and hence the predilection sites.

In the present study, *C. bovis* in cattle were in tongue (70.46%), heart (28.8%), masseter muscles (0.43%) and the gluteal muscles (0.29%). In buffaloes, *C. bovis* was only in heart (100%), with significant differences of sites in slaughtered cattle ( $P < 0.05$ ) but not in buffaloes. This agreed with Okolo (1986), Haridy *et al*. (1999), Opara *et al*. (2006), Abunna *et al*. (2008), Kebede (2008) and Basem *et al*. (2009). The variations in the predilection sites may be attributed to the animal different practices in such areas like using them daily in the many

different agricultural activities, which influenced the cysticerci distribution sites.

### Conclusion

The outcome data confirmed that cysticercosis is endemic among cattle and buffaloes. Eradication of bovine cysticercosis required cooperation between the public health and official veterinary authorities. Public health education is the key factor for control of taeniasis and cysticercosis. Meat inspection is recommended than routine inspection and diagnosis of human taeniasis and treatment is also recommended to cut he life cycle.

Conflict of Interest: The authors declared no conflict of interests.

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## Explanation of figures

**Fig.1:** Tongue of a cattle showing white nodules scattered throughout the tongue muscles (arrowheads, inset), caused by *Cysticercus bovis* of *Taenia saginata*. Bar = 1.5 cm.

**Fig.2:** Heart of a steer showing white nodule in myocardium (arrowheads, inset), caused by the *Cysticercus bovis* of *Taenia saginata* (beef measles) Bar = 1.5 cm

**Fig. 3:** Photomicrograph of acid alum carmine staining of cattle tongue. Magnification(x10), showing a cavity containing *Cysticercus bovis* (arrow) surrounded by a fibrous capsule (asterisk) with an intense inflammatory reaction rich in eosinophilic polymorph nuclear leukocytes

**Fig. 4:** Photomicrograph of an H&E staining of cattle tongue. Magnification(x10), showing a cavity containing *Cysticercus bovis* (arrow) surrounded by a fibrous capsule (asterisk) with an intense inflammatory reaction rich in eosinophilic polymorph nuclear leukocytes

**Fig. 5:** *Cysticercus bovis* prepared with Acid carmine stain, showed invaginated inverted scolex (arrow). X 10.

**Fig. 6:** SEM, *Cysticercus bovis* scolex with suckers, embedded between heart muscles.-Viable *C. bovis* in different infected organs in cattle and buffaloes (86%) while dead cyst (13.9%).

