

Occurrence of Zoonotic Sarcosporidiosis in Slaughtered Cattle and Buffaloes in Different Abattoirs in Egypt

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Abstract: Sarcosporidiosis is a zoonotic disease in domestic animals caused by *sarcocystis* sp., a cyst forming coccidian parasite with obligatory two host life cycle involving carnivorous as a definitive host and herbivorous or omnivorous as an intermediate host. This work was carried out to study the occurrence of *sarcocystis* sp., in different abattoirs of Cairo and Giza governorates, Egypt. A total of 103 slaughtered cattle and buffaloes were examined for the presence of either macroscopic or microscopic sarcocysts using naked eye examination and peptic digestion and histological examination for detecting bradyzoites. Of 61 cattle examined in abattoirs, 37 were found to be infected, with an overall prevalence 60%, while of 42 buffaloes examined in abattoirs, 29 were found to be infected, with an overall 69%. The results proved higher occurrence rate of Sarcocyst in both cattle and buffaloes.

Key words: Sarcosporidiosis • Sarcosystis • Cattle • Buffaloes • Abattoirs

INTRODUCTION

Sarcocystis was first reported in 1843 by Miescher as white threadlike cysts in striated muscles of a house mouse, without a scientific name. Then after 20 years, the parasite was simply referred to as Meischer's tubules [1]. *Sarcocystis* spp. are cyst-forming intracellular protozoan parasites with an obligatory prey predator (Two host) lifecycle [2].

Asexual stages develop in intermediate hosts after they ingest the oocyst stage from definitive-host faeces and terminate with the formation of intramuscular cysts (Sarcocysts). Sarcocysts in meat eaten by a definitive host initiate sexual stages in the intestine that terminate in oocysts excreted in the faeces. Most *Sarcocystis* species infect specific hosts or closely related host species [3].

Sarcocystosis is a zoonotic and parasitic disease commonly seen in domestic animals such as buffaloes, cattle and pigs. Among these, *Sarcocystis* *suihominis* is important in terms of public health, as meat and meat products are the main source of infection in human beings, who become infected when ingesting well-developed tissue cysts containing bradyzoites [4].

Sarcocystis spp. are highly prevalent in livestock animals, it is assumed that water buffaloes as well as cattle are solely infected with their own species. Cattle are mainly infected with *Sarcocystis* *cruzi*, *Sarcocystis*

hominis and *Sarcocystis* *hirsuta* [5]. Water buffaloes are intermediate hosts for *Sarcocystis* *fusiformis*, *Sarcocystis* *levinei*, *Sarcocystis* *dubeyi*, *Sarcocystis* *sinensis* and *Sarcocystis* *buffalonis* [6, 7].

Sarcocystosis (*Sarcocystis* infection) is generally considered non-pathogenic for cattle and buffaloes and represents an occasionally microscopic finding, in some cases, especially those sustained by *Sarcocystis* *cruzi*, clinical signs and lower performances could be recorded in the acute phase of infection [8]. Sarcocystis infection in cattle can cause abortion, reduce milk yield, neurologic signs, loss of weight and even death (Fatal cases) depending on the species and number of sporocysts ingested [1].

Sarcocystosis has been also associated with eosinophilic myositis in cattle. Gross lesions of this latter occurrence consist of green to pale yellow areas up to 15 cm long with consequent condemnation of beef containing lesions and economic losses [9].

Zoonotic concerns of cattle sarcocystosis are also important since human beings serve as definitive host for *S. hominis* and as intermediate host for several undefined species of *Sarcocystis* [10]. The illness in human include nausea, vomiting, stomach-ache and diarrhoea in cases of intestinal sarcocystosis, whereas, fever, myalgias, pruritic rashes, erythema and bronchospasm have been reported in cases of muscular sarcocystosis [3].

Differential diagnosis of *Sarcocystis* species affecting cattle and buffaloes based on morphological features of the sarcocyst walls can be achieved by microscopy and electron microscopy. These methods are specific but time consuming, limiting their application in a high number of samples. Diagnostic methods used in epidemiologic studies include peptic digestion, histopathology of tissue samples. Peptic digestion is one of the most sensitive diagnostic methods; it allows detection of bradyzoites released from sarcocysts, but not species identification. Histopathological and fresh examinations allow differentiation between thick-walled ($\geq 3\mu\text{m}$) and thin-walled ($< 1\mu\text{m}$) cysts [11]. So, the present work was initiated to determine the occurrence of *sarcocystis* sp. in slaughtered cattle and buffaloes from different abattoirs, Egypt.

MATERIAL AND METHODS

Collection of Samples: During the period from August 2011- December 2013, a sum of 103 slaughtered cattle and buffaloes was investigated for the presence of macroscopic and microscopic sarcocysts from different abattoirs in Cairo and Giza governorates, Egypt. Slaughtered animal including (61 cattle and 42 buffaloes) were observed by the naked eye for detection of macroscopic sarcocyst. About 10g muscle samples from each esophagus and skeleton were taken from slaughtered cattle and buffaloes. In cattle (58 and 41) samples were collected from esophagus and skeletal muscle, respectively. While in Buffaloes (29 and 26) samples from oesophagus and skeletal muscles were collected respectively. Then all samples were collected in plastic bags and kept at 4°C until further microscopical

examination in the laboratory of zoonosis Department, Faculty of veterinary medicine, Cairo University, While Samples for histological examination were stored in 10% formalin.

Peptic Digestion: Approximately 10 g of tissues were minced and digested for 30 min at 40°C in 50ml of digestion medium containing 1.3 g pepsin, 3.5 ml HCl and 2.5 g NaCl in 500 ml of distilled water. The digestate was poured through a fine-meshed sieve into a beaker and the filtrate was allowed to settle for 30 min. The sediment was then microscopically examined at 400x magnification [12].

Histopathological Method: The muscle tissues were immediately fixed in 10% formol saline, dehydrated, cleared and embedded in paraffin, sectioned at 5um and stained with H andE.[13]

RESULTS AND DISCUSSION

A total of 103 slaughtered cattle and buffaloes was examined for the presence of either macroscopic or microscopic sarcocysts. Of 61 cattle examined in abattoirs, 37 were found to be infected, with an overall prevalence 60%, while of 42 buffaloes examined 29 were found to be infected, with an overall prevalence of 69%. The results indicated that sarcocyst occur in both cattle and buffaloes. Macroscopic and microscopic cysts were present either in single or mixed infections as shown in (Table 1) Also, it was revealed that the esophagus is the most common organ in which the sarcocyst are present (Table 2). Macroscopic cysts were found in both esophagus and skeletal muscle in cattle and buffaloes,

Table 1: Occurrence of macrocyst and microcyst in slaughtered cattle and buffaloes,

	No. of slaughtered	Positive animal animal	No. of positive animals showing Macrocyt	No. of positive animals showing Microcyst	No. of positive animals showing both Macrocyt and Species microcyst
Cattle	61	37	2	36	1
Buffaloes	42	29	13	27	11

Table 2: Distribution of both macrocyst and microcyst in muscle samples of slaughtered cattle and buffaloes

	Cattle		Buffaloes	
	Skeletal muscle	Esophagus	Skeletal muscle	Esophagus
No. of samples	41	58	26	29
Positive samples	19	31	14	23
No. of samples having macrocyst	0	2	2	13
No. of samples having microcyst.	19	31	14	20
No. of samples having both macrocyst and microcyst	0	0	2	10



Fig. 1: Macroscopic cysts present in the esophagus.

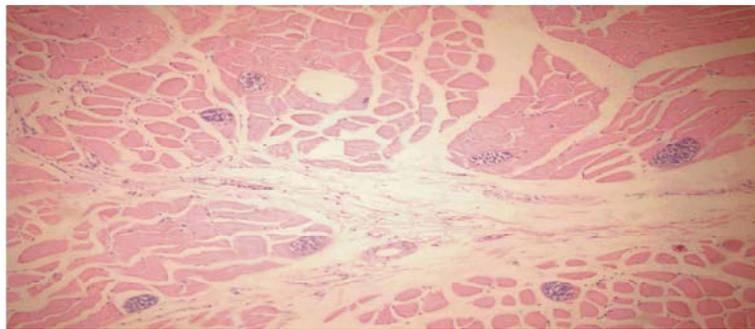


Fig. 2: Tunica muscularis of esophagus showing multiple numbers of sarcocysts invading the muscles. H and EX100.

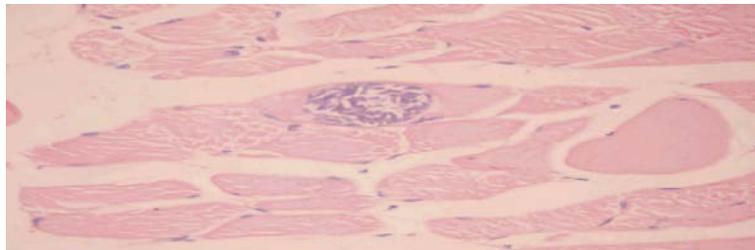


Fig. 3: Tunica muscularis of esophagus showing sarcocyst with thin wall. Notice the crescent-shaped bradyzoites. H and EX400.

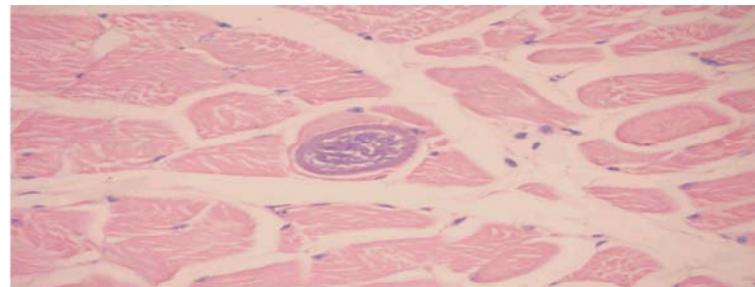


Fig. 4: Tunica muscularis of esophagus showing sarcocyst with thick wall. Notice the crescent-shaped bradyzoites. H and EX400.

The cyst was spindle or fusiform in shape and consisted of opaque bodies, milky white in color, lying between muscle bundles parallel to the longitudinal axis of the muscle mass (Fig. 1). Microscopic cyst either of thick wall

or thin wall (Figs. 3 and 4) The study revealed that infection by sarcocyst in esophagus occurs in a higher rate in buffaloes with an overall percentage 79% while in cattle 53%.

The Histopathological examination of esophagus revealed heavy infestation of Tunica muscularis with sarcocysts as (Fig. 2). The cysts appeared round or cylindrical with thin or thick wall (Fig 3 and4). It contained numerous crescent-shaped bodies (Bradyzoites). There was no any reaction around the cyst or in the muscles.

Results of the present work indicated a high prevalence of *Sarcocystis* spp. infection among slaughtered cattle and buffaloes in Cairo and Giza governorate, Egypt. This suggests that cattle and buffaloes are frequently exposed to infection due to their close relationship with dogs, cats and even wild animals that act as final hosts for these protozoa. In cattle the rate of infection by *sarcocystis* sp. was 60% which is similar to prevalence rate in Australia (52.0 %) [14]. A high prevalence rate 100.0 % in Rio Grande do Sul state was reported by Da Silva *et al.* [15], Hamidinejat *et al.* [16] in Ahvaz Khouzestan, South West of Iran, Fard *et al.* [17] in south east of Iran., in the United States [3, 18] and in Argentina [11]. An infection rate of 94% also was reported among cattle in Egypt [19]. Buffaloes were found to be infected with an overall prevalence 69%. Similar prevalence was reported in the Philippines 65% [20] and lower prevalence 57% in Iran [21]. Also there are reports indicating higher prevalence obtained by Fawaz [22], who detected an infection rate of 72.6% in examined buffaloes in Qena Governorate, Egypt and a higher infection rate 93.35% was reported by El-Menyawe and Saleh [23]. Higher infection rates have also been recorded in other countries such as 87% in India [24], 79% in Vietnam [25] and 82.9% in Iraq [12].

Dogs are commonly found in close contact with buffaloes and other ruminants. The frequent contact between ruminant and household and/or stray dogs, together with the feeding habits of dogs that allow the ingestion of infected raw offal from the slaughtered animals in abattoirs, keep the life cycle active and consequently promote the spread of infection. In this manner, the presence of infected dogs causes the dissemination of large numbers of sporocysts via feces, thus increasing the exposure of buffaloes to infection. Contamination of feed, drinking water and pastures by disseminated *Sarcocystis* spp. sporocysts is the main source of infection for buffaloes and cattle. Previous studies have shown that sarcocysts are most commonly seen in the esophagus than any other parts of the body in cattle [9, 14 and 26]. It has been found that the esophagus was the organ most frequently infected with either macroscopic or microscopic sarcocysts [18, 27]. However, other report found that the abdominal muscles

of infected buffaloes were more frequently infected than the esophagus [28].

The obtained results confirmed that Egyptian cattle and buffaloes are widely infected with *Sarcocystis* sp. This high infection is due to presence of abundant amount of dog and cat in the slaughter house which can complete life cycle and encourage spread of infection and cause sarcocystosis of slaughtered animals and thus human infection occurs. Humans can also act as intermediate hosts and are thus at risk when eating raw or improperly cooked meat from infected animals. This can result in intestinal sarcocystosis and is potentially important in terms of public health [29]. So we recommended to take attention on abattoirs to prevent transmission cycle of sarcosporidiosis.

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