Prevalence and organwise distribution of sarcocystiosis in buffaloes of Mohali, Punjab

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Abstract The study was carried at Mirha Exports private limited at Mohali, Punjab, from December 2012 to May 2013 during which 1000 buffaloes of 2–3 years of age slaughtered for meat purposes were screened for the *Sarcocystis* species. Most of the animals examined at antimortem appeared normal and clinically healthy. However, at slaughtering, the gross and microscopic examination of representative samples of striated muscles collected from slaughtered buffaloes revealed 95.50 % prevalence of *Sarcocystis* species. Out of 1000 samples examined, 955 samples (95.55 %) were infected with microscopic cysts with size ranging from 19.1 to 95.9 × 10.2 to 68.9 µm cyst, while 6 samples (0.60 %) had mixed infection with macroscopic cyst with size ranging from 1270 to 19,000 × 700 to 7000 µm cyst of white or creamy colour and microscopic cysts. Among the muscles infected with cysts, highest number of cysts were recorded in tongue muscles (87.40 %) followed by oesophageal muscles (83.60 %), cardiac muscles (53 %) and diaphragmatic muscles (31.30 %).

Keywords Buffalo · *Sarcocystis* · Prevalence · Mohali Punjab

Introduction

Livestock is an integral component of Indian economy. It contributes to both National and agricultural GDP. However, the productivity of domesticated animals has fallen over several years, owing to multiple numbers of reasons, the parasitic infection being among the major factors affecting livestock of the country. Sarcocystiosis is one of the most common parasitic zoonotic disease of the livestock. *Sarcocystis* species is a cyst-forming coccidian parasite which involves two obligatory hosts, carnivores, as definitive host (dogs, cats) and herbivores (sheep, cattle, buffalo, pig, camels) or omnivores (man), as intermediate host during its life cycle (Soulsby 1982). A host may be infected with more than one *Sarcocystis* species (Dubey et al. 1996; Bhatia 2000). The cysts can be either macroscopic or microscopic in size. These are found in striated muscles and other muscles like esophagus, heart, tongue, diaphragm, and intercostal muscles of cattle and buffaloes. Among animals, water buffalo has been found to be infected with four species of *Sarcocystis*. *S. fusiformis* (feline definitive host), *S. buffalonis* (feline definitive host), *S. levinei* (canine definitive host) and *S. dubeyi* (definitive host unknown but not cat or dog). The sarcocysts of *S. fusiformis* and *S. buffalonis* are macroscopic whereas, *S. levinei* and *S. dubeyi* are microscopic in nature (Soulsby 1982).

Animals infected with *Sarcocystis* species exhibit fever, anorexia, anaemia, diarrhea, cachexia, weight loss, increased heart rate, abortion, myositis, neurological signs,

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and occasionally may lead to death (Bhatia 2000). However, most of the animals infected with sarcocystiosis appear normal and healthy at anti-mortem examination (Soulsby 1982). Heavily infected animals become weak, debilitated and emaciated with pale mucous membranes, ascites, lymphadenopathy and in some cases, loss of hairs from switch of tail (Dubey et al. 1989a).

Sarcocystiosis has been observed worldwide. *Sarcocystis fusiformis* was first found in muscles of a water buffalo in Vietnam and was named *Balbiania fusiformis*, which was later classified as *Sarcocystis* (Levine 1977). Disanaik and Kan (1978) described a second species of *Sarcocystis*, *Sarcocystis levinei*, in buffaloes of Malaysia. Dubey et al. (1989b) found a third species in buffaloes from India, based on its distinctive wall but did not name it. Huong and Uggla (1999) found the same parasite in buffaloes in Vietnam and consequently named it *Sarcocystis dubeyi*. Huong et al. (1997) described a fourth species, *Sarcocystis buffalonis*, in buffaloes from Vietnam.

In India, sarcocystiosis in buffaloes has been reported by several authors (Gill et al. 1978; Mohanty et al. 1995; Venu and Hafeez 2000; Ghoshal et al. 1986; Deshpande et al. 1983 and Saha et al. 1986). However there has been no such study carried out at abattoirs of Punjab and Mirha Exports Pvt. Ltd in particular. Hence this study was aimed to determine the prevalence of *Sarcocystis* species in buffaloes of Mohali, Punjab India.

Materials and methods

Collection of samples

The study was carried at Mirha Exports slaughterhouse located at Mohali, Punjab, from December 2012 to May 2013 during which 1000 buffaloes of 2–3 years of age slaughtered for meat purposes were screened for the sarcocystiosis. The representative samples like striated muscles (tongue, oesophagus, heart, and diaphragm) were collected from each freshly slaughtered buffalo and preserved in properly labeled ice bags which were then transported from the slaughter house to the parasitological laboratory of abattoir. The samples were kept at refrigeration temperature until examination.

Examination of muscle/offal samples

Macroscopic examination

For macroscopic examination, the samples were placed in petri-dishes and examined grossly for the colour, shape, size and location of the cyst was noted.

Microscopic examination

The microscopic examination of the samples was carried out by following procedures:

Muscle squash preparation Muscle (1 gm) was cut into small pieces (3–5 mm thick) and crushed firmly between two glass slides and examined under low power microscope (10×) for the presence or absence of microsarcocysts (Hamidineja et al. 2010).

Rapid isolation technique Small pieces of muscle (2–3 cm) were cut and teased in normal saline solution (0.85 %) with needles and forceps for 2 min in a watch glass and the samples were examined for the presence of microsarcocysts (Juyal and Bhatia 1989).

Results

Most of the animals examined at anti-mortem appeared normal and clinically healthy. However, at slaughtering, the gross and microscopic examination of 1000 samples revealed 95.50 % prevalence of cyst of *Sarcocystis* species. Out of 1000 samples examined, 955 samples (95.55 %) were infected with microscopic cysts with size ranging from 19.1 to 95.9 × 10.2 to 68.9 µm cyst, while 6 samples (0.60 %) had mixed infection with macroscopic cyst with size ranging from 1270 to 19,000 × 700 to 7000 µm cyst of white or creamy colour (Figs. 1, 2) and microscopic cysts (Table 1). Among the muscles infected with cysts, highest infection rate was observed in tongue muscles (87.40 %) followed by oesophageal muscles (83.60 %), cardiac muscles (53 %) and diaphragmatic muscles (31.30 %) (Table 2).

Fig. 1 Grossly visible sarcocyst in a striated muscle

Fig. 2 Grossly visible sarcocyst in viscera

Discussion

Sarcocystiosis is a parasitic zoonotic disease commonly observed in domestic animals such as buffaloes, cattle, and pigs. It has a significant impact by impairing the production of domestic animals, besides, being a public health concern. The present study revealed a higher prevalence rate of *Sarcocystis* species infection among buffaloes slaughtered at Mirha Exports Private Limited in Punjab, India. Similar results of higher prevalence were recorded by workers from different states of India and from abroad. Ramanujachari and Alwar (1951) reported that buffaloes show higher prevalence of sarcocystiosis than cattle. The natural occurrence of sarcocystiosis in buffaloes was observed to

be 80 % in Madhya Pradesh (Ghoshal et al. 1986), 59 % of 283 buffaloes examined in Bihar (Sahai et al. 1982), 86.6 % of 60 buffaloes examined in Orissa (Mohanty et al. 1995). Venu and Hafeez (2000) observed 79.9 % sarcocystiosis in buffaloes of Andhra Pradesh. In New Zealand, the prevalence rate of *Sarcocystis* species in buffaloes was found to be 98.0 % by Bottner et al. (1987). In Brazil, prevalence of *Sarcocystis* was reported to be 100 % by Pana et al. (2001).

Muscles wise prevalence of infection was also reported higher in this study. In the present study, tongue, oesophagus and cardiac muscles were found to be the most common sites for *Sarcocystis* species infection in slaughtered buffaloes. Similar results were observed by El-Dakhly et al. (2011) and Oryan et al. (2010). The higher prevalence of *Sarcocystis* infection in buffaloes could be attributed to the fact that the owners raise pets (cats and dogs) which makes transmission between buffaloes and these pets easier. Buffaloes are let loose to graze in the open and they also ingest sporocysts with feed and water, hence become contaminated. Further, the state of Punjab has tropical climate, the days are very hot favouring mixing of buffaloes and dogs near water bodies which results in rapid transmission of infection. The animals shed sporocysts in large numbers and these sporocysts can survive in the external environment for several months resulting in higher prevalence of infection (Dubey et al. 1989a). Role of invertebrate transport hosts in spreading infection and also little or no immunity to re-shedding of *sporocysts* after each meal results in rapid transmission (Collier et al. 1998).

This study could pave a way for carrying out the prevalence study in whole state so as to develop package of

Table 1 Prevalence of *Sarcocystis* in buffaloes slaughtered at Mirha Exports Pvt limited abattoir Mohali, Punjab

Samples examined	Samples positive	Samples positive for microscopic cysts	Samples positive for macroscopic cysts	Mixed infection with micro and macro cysts
1000	955 (95.50)	955 (95.50)	6 (0.60)	6 (0.60)

Figures in the parenthesis represents percentage of infection

Table 2 *Sarcocystis* infection in different muscles of slaughtered buffaloes

Muscles infected with cysts	Samples examined	Samples positive	Samples positive for macroscopic cysts	Samples positive for microscopic cysts	Mixed infection with micro and macro cysts
Tongue muscle	1000	874 (87.40)	1 (0.10)	874 (87.40)	1 (0.10)
Oesophageal muscle	1000	836 (83.60)	2 (0.20)	836 (83.60)	2 (0.20)
Cardiac muscle	1000	530 (53.00)	1 (0.10)	530 (53.00)	1 (0.10)
Diaphragmatic muscle	1000	313 (31.30)	2 (0.20)	313 (31.30)	2 (0.20)

Figures in the parenthesis represents percentage of infection

practices for their effective control and also to educate the people about the zoonotic aspect of this disease so that minimum transmission between animals and human do occur.

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