

# Prevalence of Sarcocystosis in Buffalo Meat in Major Cities of India

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## ABSTRACT

A total of 1,949 oesophagus and 355 meat samples (masseter or cervical region) collected from slaughtered buffaloes were examined by naked eye for presence of Sarcocysts (macro cysts) in different cities (Hyderabad, Mumbai, Kolkata and Delhi) of India. The overall prevalence of Sarcocysts (macro cysts) was 23.87%. A total of 102 tissue samples from oesophagus were subjected to histomorphological examination. The overall prevalence of Sarcocysts (micro cysts) was 60.78%.

**Keywords :** *Sarcocystosis, Sarcocysts, Buffalo, Meat*

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India has a huge livestock wealth and ranks first in the world for buffalo population (108.7 millions in the year 2012). India has the distinction of producing largest amount of buffalo meat in the world (1.61 million tonnes in the year 2015-16). In the year 2016-17, India's export of buffalo meat touched a record of Rs. 26,161 crores exporting 13,23,576 MT of buffalo meat. Buffalo meat is one of the largest commodities exported from India mainly to Middle East and South East Asian nations (APEDA, 2016).

Sarcocystosis is an important problem associated with export of buffalo meat. For the first time, Sarcocystis cysts were discovered in the striated muscles of mice by Meischer in 1834. Thereafter, the protozoan parasite has been described in several domestic and wild animals throughout the world. The parasite has an obligatory two host life cycle having pre-predator relationships. Herbivores and omnivores act as the intermediate hosts, acquire infection by ingesting the sporocysts which are shed in the feces of carnivores (dogs and cats) known to act as definitive hosts. The distribution of Sarcocystis in intermediate hosts is recorded in various organs i.e., heart, oesophagus, diaphragm, tongue, ocular, thigh and tail muscles. On the other hand, definitive hosts become infected with Sarcocystis by ingesting the sarcocysts in the muscles of intermediate hosts. Stray dogs play a main role in transmission of infection, as they can be easily seen eating meat offal nearby slaughter houses (Dubey *et al.*, 2016). In India, the incidence of Sarcocystosis in buffaloes was found to be very high. It was 86.6% in Orissa (Mohanty *et al.*, 1995), 79.9% in Andhra Pradesh (Venu and Hafeez, 2000), 66.42% in Andhra Pradesh (Jyothisree *et al.*, 2018) 59% in Bihar (Sahai *et al.*, 1982)

and 80% in Madhya Pradesh (Ghoshal *et al.*, 1986). A variety of species of Sarcocystis have been found in cattle, buffaloes, sheep, goats, horses and pigs (Seleque, 1990). Major Sarcocysts of buffaloes are 1) *S. fusiformis* (Definite host – cat), 2) *S. levinei* (Definite host – dog) and 3) *S. hominis* (Definite host – Man).

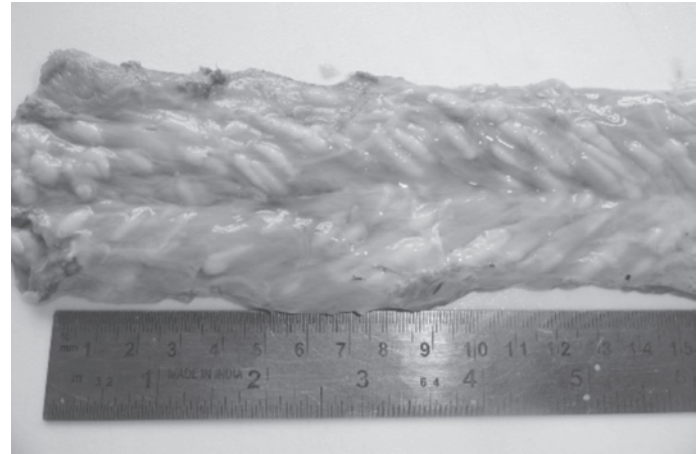
A total of 1,949 oesophagus and 355 meat samples (Masseter or cervical region) collected from slaughtered buffaloes were examined by naked eye for the presence of Sarcocysts (macro cysts) in different cities (Hyderabad, Mumbai, Kolkata and Delhi) of India during the period from April, 2014 to March, 2016. About 15 cm length of oesophagus was collected from each slaughtered buffalo. The contents in the lumen of oesophagus were removed and incised with scissors along the length of the oesophagus so that the oesophagus can be spread on examination table. The mucosa was removed. Observed for presence of Sarcocysts on submucosal area and also on serosal area of oesophagus. Few incisions were made perpendicular to the length of oesophagus with scalpel about 1 cm apart for facilitating to locate Sarcocysts embedded deep in the muscle of oesophagus. Similarly, the meat samples collected from masseter region or cervical region were incised about 1 cm apart with a scalpel and observed for presence of Sarcocysts (macro cysts).

Fourteen oesophagus tissue samples where large Sarcocysts were observed, seven oesophagus tissue samples where small Sarcocysts were observed and 81 tissue samples where no Sarcocysts were observed on naked eye examination were processed for histological examination. About 3 cm X 1 cm length of oesophagus wall was collected and fixed in 10% buffered formal saline. They were processed routinely for

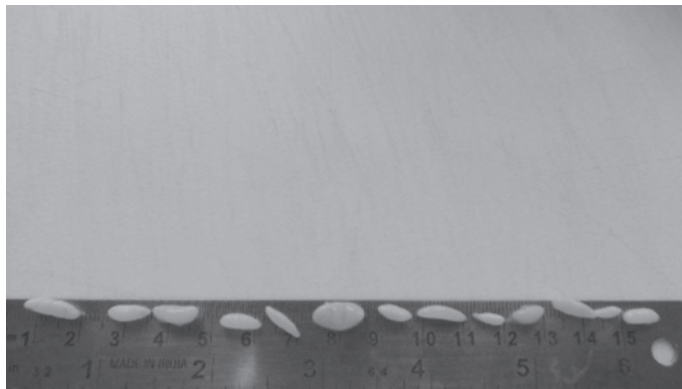
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making 5µ thick paraffin sections and stained with Haematoxylin and Eosin. The stained microslides were examined under microscope for presence of Sarcocysts (micro cysts).

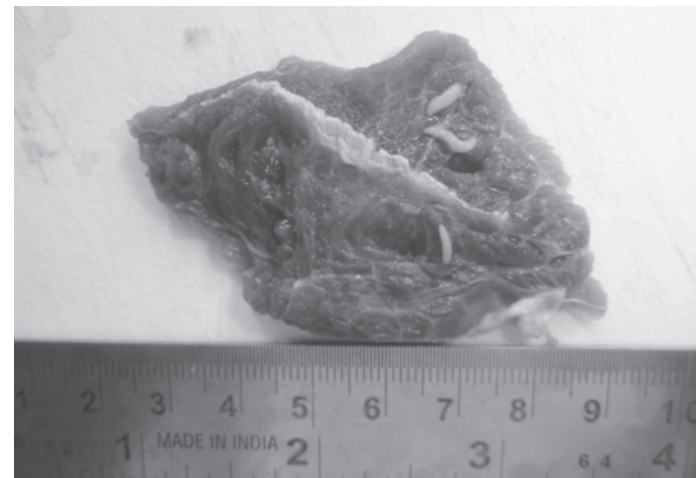
Highest percentage of Sarcocysts was recorded in Mumbai (29.45%; 149 positives out of 506) and lowest from Delhi (8.97%; 7 positives out of 78) (Table 1). The Sarcocysts were few to plenty and of different sizes and shapes (cucumber seed shape or round or oval). In some animals, uniform sized Sarcocysts were present and in some other animals, Sarcocysts of different sizes were present in same animal. They were present on the surface of submucosal area (Fig. 1) or serosal area (Fig. 2) or embedded deep in oesophagus wall (Fig. 3). They were present in meat collected from cervical region or masseter region (Fig. 4).



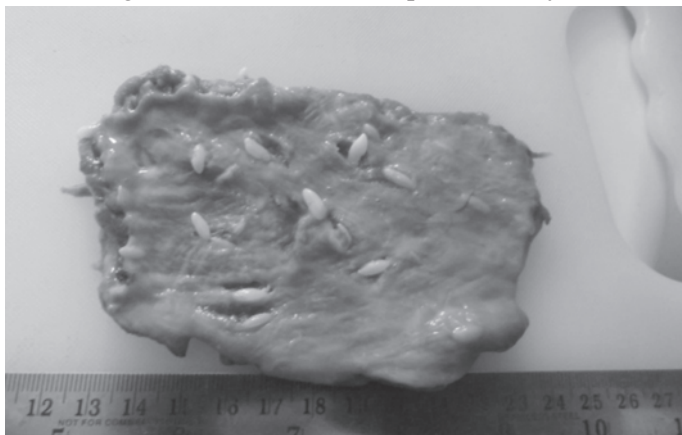
**Fig. 3. Sarcocysts in serosal area of oesophagus**



**Fig1. Different sizes and shapes of Sarcocysts**



**Fig. 4. Sarcocysts in meat**



**Fig. 2. Sarcocysts in mucosal area of oesophagus**

23.87% of the buffaloes examined at different cities of India showed grossly visible Sarcocysts indicating the severity of the problem associated with economic loss due to condemnations (Table 1). The prevalence was comparatively higher in oesophagus (26.89%) than meat samples (7.32%). This might be due to higher predilection of Sarcocysts in oesophagus and larger sample size (1,949 oesophagus samples) of oesophagus examined compared to meat samples. The prevalence was higher in Mumbai (29.45%) and Hyderabad (24.64%) followed by Kolkata (15.88%) and lowest in Delhi (8.97%). The lowest prevalence at Delhi might be due to small

**Table 1: Overall prevalence of Sarcocysts (macro cysts) in oesophagus and meat / muscle of buffaloes on naked eye examination**

S. No.	City	Total no. of oesophagus & meat / muscle examined	No. of oesophagus and meat / muscle positive	Positive percentage
1	Hyderabad	1,380	340	24.64
2	Mumbai	506	149	29.45
3	Kolkata	340	54	15.88
4	Delhi	78	7	8.97
	Total	2,304	550	23.87

sample size (78 buffaloes). Out of 102 oesophagus tissue samples examined histologically, Sarcocysts were observed in 60.78% of tissues. The microcysts were invariably present in all the samples where grossly visible macrocysts were present and also in 50.62% of the samples where grossly visible macrocysts were absent. As per literature available, *S. fusiformis* cysts are macrocysts and *S. levinei* and *S. hominis* cysts are microcysts. Literature also says that it is impossible to identify the species of Sarcocysts on gross morphological examination (Dubey *et al.*, 2016). Based on the above results, it is not clear whether microcysts present belong to initial growing stages of *S. fusiformis* or adults of *S. levinei* and *S. hominis*. Prevalence of Sarcocystosis in buffaloes was described in Egypt (El Dakhly *et al.*, 2011), Vietnam (Huong, 1999) and Turkey (Retzlaff and Weise, 1969). In India, the incidence of Sarcocystosis in buffaloes was found to be very high. It was 86.6% in Orissa (Mohanty *et al.*, 1995), 79.9% in Andhra Pradesh (Venu and Hafeez, 2000), 66.42% in Andhra Pradesh (Jyothisree *et al.*, 2018) 59% in Bihar (Sahai *et al.*, 1982) and 80% in Madhya Pradesh (Ghoshal *et al.*, 1986). The zoonotic importance of the disease was also described in India and abroad (Shah, 1987; Jain and Shah, 1987; Juyal and Bhatia, 1989, Hu, 2003). For prevention of Sarcocysts in buffaloes, it is suggested not to contaminate the stools of definite hosts (dog, cat, human etc.) with the fodder of buffaloes and the meat / offals of buffalo is to be thoroughly heated / cooked at > 70°C for at least 30 minutes for breaking the life cycle.

High prevalence of Sarcocysts (23.87% macro cysts and 60.78% of micro cysts) was noticed in slaughtered buffaloes at different cities (Hyderabad, Kolkata, Mumbai and Delhi) of India. The value of buffalo meat is reduced due to presence of Sarcocysts unaesthetically.

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