



Full Length Research Article

SARCOCYSTOSIS INFECTION OF BUFFALO CARCASSES IN BASRA GOVERNORATE- IRAQ

Ali Rasheed Maktoofa and *Mudhar A. S. Abu Tabeekh

Basra Veterinary Hospital, Basra, Iraq

ARTICLE INFO

Article History:

Received 17th August, 2015
Received in revised form
19th September, 2015
Accepted 09th October, 2015
Published online 30th November, 2015

Key Words:

Basra, Buffalo carcasses,
Microscopic, Microscopic,
Sarcocystosis.

ABSTRACT

This study was conducted to determine the macroscopic and microscopic infection with *Sarcocystis* species. Two hundred buffalo carcasses in the abattoir of Ashar-Basra city were used. The macroscopic and microscopic examination included trichinostomy method and squeezing method. The esophagus, heart, diaphragm and skeletal muscles were investigated. The results of the present study showed that the incidence of macroscopic and microscopic was 16% and 84.6% respectively, where it was noted that the incidence examine by capillaries telescope was of 77.5% and by squeezing method was 72.2%. It also recorded the high incidence of the disease 95.8% was in the esophagus and the low value in the heart 30.9%, on the other hand the result showed that the highest proportion of macroscopic incidence in an area where the esophagus was 90.4% and the least in the heart, reaching 14.8%. It turns out that the incidence of progressing whenever age where the percentage of incidence buffalo with ages 4 years and over, the microscopic examination was 95.6 and 57.3% in ages under two years. The macroscopic examination infection rate also increased with age and it was 60% in the ages of four years or more, while 1.8% at ages younger than two years.

Copyright © 2015 Ali Rasheed Maktoofa and Mudhar A. S. Abu Tabeekh. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Since the discovery of *Sarcocystis* cysts in the striated muscles of mice by Miescher in 1834, this protozoan parasite has been described in domestic and wild animals throughout the world (Juyal and Bhatia, 1989). Sarcocystosis is caused by species of *Sarcocystis*, an intracellular protozoan parasite in the phylum Apicomplexa. Almost 200 species of *Sarcocystis* have been described to date (Levine, 1986). *Sarcocystis* parasite is an obligate one which needs two hosts to complete its life cycle (Rommel, 1985). The parasite infected wide ranges of animals with host specificity (Dubey and Fayer, 1983). The biological cycle of these parasites is based on a prey-predator relationship between a definitive host usually carnivores and an intermediate host usually herbivores, omnivores, rodents, and birds (Bowman, 2009). The economic losses related to carcasses exclusion and pathological related manifestation of both final and intermediate hosts (Kimberling, 1988). Five species of *Sarcocystis* have been described from the water buffalo. The presence of *Sarcocystis* species in water buffalo was first observed by Railliet in 1897. He briefly described the large balbiani and named the parasite *Balbiana fusiformis* (later, it was renamed *Sarcocystis fusiformis*).

This is the largest among the *Sarcocystis* species found in water buffalo, which use cats as definitive hosts. A second *Sarcocystis* species in buffalo, *Sarcocystis levinei*, is smaller, and uses canines as its definitive host (Dissanaike and Kan, 1978). Since the 1980s, several other *Sarcocystis* species in water buffalo have been reported. For example, *Sarcocystis cruzi* uses dogs as its definitive hosts (Zhang and Zuo, 1992). *Sarcocystis sinensis* was described by Zuo *et al.* (1995), but its definitive host is still unknown. *Sarcocystis buffalonis* was recognized by Huong *et al.* (1997) and cats as its definitive hosts. *Sarcocystis dubeyi* was described by Huong and Uggla (1999). However, *Sarcocystis hominis*, a parasite in cattle, has never been found to naturally infect water buffalo. Very recently, a report employing genetic and ultrastructural methods to investigate the parasites of cattle and water buffalo in Vietnam concluded that certain parasites are shared by water buffalo and cattle (Jehle *et al.*, 2009).

The morphology of *Sarcocystis spp.* has received more attention macroscopically, microscopically and ultramicroscopy. Barwary *et al.* (2009) recorded that out of eleven biopsy samples (taken from the oblique muscles of the left flank) trichinostomy was the less sensitive (7/11), post trichinostomy drop examination (9/11) and lately the most efficient methods which are peptic digestion (11/11) and histopathological method (3/3). Faraj and Kawan (2012) found that the highest infection rate with sarcocystosis in wild birds

*Corresponding author: Mudhar A. S. Abu Tabeekh,
Basra Veterinary Hospital, Basra, Iraq.

was in the thorax muscles (6.2%) and the lowest in the neck muscles (1.6%), also the macroscopic infection rate was higher (13.5%) in males than females (5%). The researcher recorded direct correlation between the number of spore cyst raised in the stool with the amount of infected meat (Al-Delaimy, 1992), another relationship between infection rates and age where this ratio increases with age (Al- Ameri, 1995). Dubey *et al.* (1989), and Dubey and Odening (2001) recognized 35 types of sarcocysts based on the structure of the sarcocyst walls. Water buffaloes (*Bubalus bubalis*) harbor four *Sarcocystis* spp. (Huong, 1999).

Two macroscopic (*S. fusiformis* and *S. buffalonis*) with cats as definitive hosts and two microscopic (*S. levinei* with dogs as definitive hosts and *S. dubeyi* with unknown definitive host but thought to be zoonotic). The infection of water buffaloes with macroscopic *Sarcocystis* cyst renders the meat unmarketable leading to downgrading and condemnation of the carcass. *S. fusiformis* infecting water buffaloes (*Bubalus bubalis*) was studied in different countries and showed high incidences like, 83.3% in Turkey (Retzlaff and Weise, 1969), 94% in China (Xiao *et al.* 1988) and 88% in Vietnam (Huong *et al.* 1995). In Egypt, reports about *S. fusiformis* prevalence were variable from high 100% (Ghaffar *et al.* 1978) to low 6.9% (El-Dakhly *et al.* 2011). The African buffalo has been known as an intermediate host of sarcocyst for a long time. In the Kruger National Park- South Africa out of 97 buffaloes 86% were infected (Bassonet *et al.* 1970).

The sequence difference in isolates of *Sarcocystis hominis*-like cysts from water buffaloes, and isolates of *S. hominis* cysts from cattle were very low, only about 0.1%, much lower than the lowest value (1.7%) among different species. Combined with their morphological structure, these sequence data indicate that the 4 isolates from cattle and water buffalo might be the same species, i.e., *S. hominis*, suggesting that both cattle and water buffalo may serve as the intermediate hosts for this parasite (Yang *et al.* 2001).

MATERIALS AND METHODS

Gross examination

200 carcasses of buffaloes were checked in the abattoir of Ashar – Basra Governorate, southern of Iraq twice visits during a week. They were examined by viewing the macroscopic different lesions in oesophagus, heart, skeletal muscle and diaphragm by made longitudinal slots and recorded age and sex for each buffalo carcass (Al-Bayati, 2008).

Microscopic examination

A collection of small samples (10-30 g) of buffalo Organs were placed in jars numbered and registered by the age and sex of every carcass. The samples were transferred coolly to the laboratory for the completion of laboratory tests, which included: 1- Examination of capillaries (Trichinoscopy): according to Scott (1930) and Daoud (1976), more than 0.5 g of each organs were placed on a glass slide and covered with another slide with until the sample became thin then examined under a microscope magnification (20 ×) to investigate the microstructure sarcocystis.

2- Squeezing method: as small pieces of examined organs (4-5 g) were tested and compressed by a tool used for this purpose to put a drop of sap on a glass slide and examined under a microscope magnification (40 ×) to identify the microcysts with its distinguished capsule according to Al-Bayati (1993).

RESULTS AND DISCUSSION

The buffalo, is intermediate host for *S. levinei* and *S. fusiformis* in which dogs are the final host for the first type and cats for the second type (Collins and Charleston, 1979; Dessouky *et al.* 1984), conclude from this that the most buffalo infected with the parasite especially in Basra province as a result to the large number of dogs and cats. The results of the present study as in Table 1, 2 indicated that the percentage of macroscopic infection of buffaloes with *Sarcocystosis* is less than results of microscopic infection. The results also showed the lesions of esophagus in microscopic and microscopic examination which was 95.8 and 90.4 respectively. These results agreed with that of Jain and Shah (1987) who found that the microscopic type is more pathogenesis than that of macroscopic type of sarcocystosis (Jain and Shah, 1987).

Similar results were showed by Oryan *et al.* (2010), who determine the prevalence, distribution pattern, and the *Sarcocystis* species involved in slaughtered water buffaloes (*Bubalus bubalis*) in the Khuzestan, Iran by macroscopic and histological examination. The esophagus, heart, diaphragm, tongue, masseter, and thigh muscles were investigated. Esophagus and thigh muscles of only 3 of the 100 examined water buffaloes (3%) were infected with macroscopic *Sarcocystis*, whereas at microscopic level *Sarcocystis* were found in 83 of the 100 examined animals (83%). The highest prevalence rate of microscopic cysts was found in masseter muscle (57.1%) and then followed by tongue, diaphragm, esophagus, heart, and finally, thigh muscles (30.0%).

Table 1. The percentage (%) of macroscopic infection of buffaloes with *Sarcocystosis*

The organ	Trichinoscopy method	Squeezing method
Esophagus	90.4	-
Diaphragm	72.2	-
Skeletal muscle	-	77.5
Heart	-	14.8

Table 2. The percentage (%) of microscopic infection of buffaloes with *Sarcocystosis*

The organ	Microscopic examination
Esophagus	95.8
Heart	30.9

(Huong *et al.* 1997) examined buffalo carcasses grossly at slaughter in Ho Chi Minh City in southern Vietnam and found that *Sarcocysts* of *S. buffalonis* were found in 68 (10.5%) of 647 cases. Abu-Elwafa *et al.* (2015) recorded that issue specimens from esophagus, heart, tongue, diaphragm and throat muscles were recovered from 550 water buffaloes slaughtered at Mansoura abattoir in Dakahlia Province, Egypt, at the period between July 2009 and June 2010. *S. fusiformis* cysts were recovered from 58.72% of the examined animals.

The prevalence of infection was 100% in the esophagus, while no infection was detected in the heart. Ultrastructurally, the cyst wall was thin (1-3µm) exhibiting highly branched and anastomosed cauliflower-like villar protrusions. In the north of Iraq-Kurdistan region- Dohuk governorate, Goat sarcocystosis showed to be occur in percentage of 70 –93 % for microscopic cysts (microcysts) of *Sarcocystis spp.* of goats by several diagnostic techniques (gross exam, trichinostomy , squeezing method and post trichinostomy drop exam) (Al-Bayati, 2008). On his study about sarcocystosis of bovine in Babylon province, the results of Mohammad (2012) showed that the prevalence rate of microscopic form *Sarcocystis cruzi* detected by trichinostomy and histological technique were 66.5 % and 70% respectively. According to examined organs, the higher percentage recorded in esophagus 64%, and least percentage in diaphragm 47%, also the prevalence in females 79. 03 % was higher than males 60. 86%.

As in Table 3, our results revealed that the older age of the animal, the high prevalence of infection. This finding which is most likely due to a longer exposure periods of aged animals to the sporocysts infection and the cysts needed long time to appear macroscopically is coincided with Huang (1999), El-Dakhly *et al.* (2011) and Dubey *et al.* (1989). Oryan *et al.* (2010) studied the slaughtered water buffaloes (*Bubalus bubalis*) in the Khuzestan, Iran. There was no significant difference between males (83.6%) and females (82.0%) or between two investigated age groups (<or=2 years old, 78% versus >2 years old, 88%). Abu-Elwafa *et al.* (2015) examined 550 water buffaloes slaughtered at Mansoura abattoir at Dakahlia Province, Egypt. Animals under investigation were assigned into two age groups, the first one was over five years of age (n=400), while the other group was 2-3 years old (n=150). The researcher found that aged buffaloes were more infected than young buffaloes.

Table 3. The percentage (%) of Sarcocystosis infection in buffaloes according to age

The age	Macroscopic examination	Microscopic examination
years 4 <	60	95.6
years 4 >	18	57.3

Conclusion

The result gives the signal that the province of Basra climate is suitable for parasite spreading and infection. The study showed that buffaloes ready for a high parasite infection with sarcocystosis. The macroscopic infection of buffaloes with Sarcocystosis is less than results of microscopic infection and that aged buffaloes were more infected than young buffaloes. This is a clear sign that the disease of common diseases among humans and animals and must be given its importance side by specialists and those interested in the common diseases and public health.

REFERENCES

- Abu-Elwafa, S.A., Al-Araby, M.A. and Abbas, I.E.A. 2015. *Sarcocystis fusiformis* (Railliet, 1897) infecting water buffaloes (*Bubalus bubalis*) in Dakahlia Province, Egypt. *Int. J. Advance. Res.* 3 (2): 116-120.
- Al – Bayati, S M. 1993. Study in the epidemiology of bovine sarcocystosis in Baghdad area. M. Sc. Thesis, College of Veterinary Medicine, University of Baghdad, Iraq.
- Al- Ameri, A.M.A. 1995. Study in the epidemiology of sarcocystosis in buffalo in Baghdad governorate. M. Sc. Thesis, College of Veterinary Medicine, University of Baghdad, Iraq.
- Al- Delaimy, J. K. A. 1992. Study in the epidemiology of sarcocystosis in sheep of Baghdad governorate. M. Sc. Thesis, College of Veterinary Medicine, University of Baghdad, Iraq.
- Al-Bayati, S.M. 2008. Comparative Study on Goats Sarcocystosis Diagnostic Techniques in Dohuk Governorate. *J. of al-Anbar university for pure science*: Vol.2: No.2.
- Barwary, M.S.Q, Al-Bayati, S.M.H., Hussain, N.J. and Hussain, Y.Y. 2009. Trocarization for Diagnosis of Sarcocystosis in Sheep. *Bas. J. Vet. Res.* 8(1): 78- 87.
- Basson, P.A., McCully, R.M., Kruger, S.P., Niekerk, J.W.van, Youngm E. and Vos, V de. 1970. Parasite and other diseases of the African buffalo in the Kruger National Park. *Onderstepoort j. of the Vet. Res.* 37: 11-28.
- Bowman, D. 2009. Georgis Parasitology for veterinarians. 9th ed. Saunders, an imprint of Elsevier Inc.
- Chen, X.W., Zuo, Y.X. Hu, J.J. 2003. Experimental Sarcocystis hominis infection in a water buffalo (*Bubalus bubalis*). *The J. of Parasitol.* 89: (2). 393-394.
- Daoud, I. S. 1976. Studies of some factors covering survival of sarcocystosis. M. Sc. Thesis, Liverpool University, England.
- Dissanaike, A.S. and Kan, S.P. 1978. Studies on Sarcocystis in Malaysia I. Sarcocystis levinei n. sp. from the water buffalo *Bubalus bubalis*. *Zeitschrift fur Parasitenkunde* 55: 127–138.
- Dubey, J. P. and Odening, K. 2001. Toxoplasmosis and related infections. In Parasitic diseases of wild mammals, W. M. Samuel, M. J. Pybus, and A. A. Kocan (eds.). Iowa State University Press, Ames, Iowa. 478–519.
- Dubey, J. P., Speer, C. A. and Fayer, R. 1989. Sarcocystosis of animals and man. CRC press, Boca Raton, Florida.
- Dubey, J.P and Fayer, R. 1983. Sarcocystosis. *British. Vet. J.* 139:371 – 160.
- El-Dakhly, K. M., El-Nesr, K. A., El-Nahass, E., Hirata, A., Sakai, H. and Yanai, T. 2011. Prevalence and distribution patterns of Sarcocystis species in buffaloes in Beni-Suef, Egypt. *Tropic. Anim. Health and Prod.* Epub ahead of print.
- Faraj, A. A. and Kawan, M. H. 2012. Detection of Sarcocystosis in some wild birds. *Iraqi Vet. Med. J.* 36 (2): 65-70.
- Ghaffar, F., Hilali, M. and Scholtyssek, E. 1978. Ultrastructural studies of Sarcocystis fusiformis (Railliet, 1897) infecting the Indian water buffalo (*Bubalus bubalis*) of Egypt. *Tropenmed. Parasitol.* 29: 283-294.
- Huang, L. T. T. 1999. Prevalence of *Sarcocystis spp.* In water buffaloes in Vietnam. *Vet. Parasitol.* 86 (1): 33-39.
- Huang, L. T. T. and Uggla, A. 1999. *Sarcocystis dubeyi* n. sp. (Protozoa: Sarcocystidae) in the water buffalo (*Bubalus bubalis*). *J. of Parasitol.* 85:102–104.
- Huang, L.T. T., Dubey, J. P. and Uggla A. 1995. Prevalence and identity of Sarcocystis in water buffaloes and cattle

- slaughtered at some abattoirs in Ho Chi Minh City. Proc. 1st Conf. Vet. Med. Anim. Husb., University of agriculture and Forestry, Ho Chi Minh City, Vietnam, I: 88-97.
- Huong, L.T.T., Dubey, J. P., Nikkila, T. and Uggla, A. 1997. *Sarcocystis buffalonis* n. sp. (Protozoa: Sarcocystidae) from the water buffalo (*Bubalus bubalis*) in Vietnam. *J. of Parasitol.* 83:471-474.
- Jain, P.C. and Shah, H.L. 1987. Sarcocystis hominis in cattle in Madhya Pradesh and its public health importance. *Indian Vet. J.* 64:650-654.
- Jehle, C., Dinkel, A., Sander, A., Morent, M., Romig, T., Luc, P.V., De, T.V., Thai, V.V and Mackenstedt, U. 2009. Diagnosis of *Sarcocystis* spp. *Vet. Parasitol.*, 166, 314-320.
- Juyal, P.D. and Bhatiam B.B. 1989. Sarcocystosis: an emerging zoonosis. *Indian Vet. Med. J.* 13:66-9.
- Kimberling, C. V. 1988. Sarcocystosis. In: Diseases of sheep. 3ed, Lea and Fibiger, Philadelphia, USA.
- Levine, N.D. 1986. The taxonomy of Sarcocystis (Protozoa, Apicomplexa) Species. *J. Parasitol.* 72 (23): 372-382.
- Mohammad, M. H. 2012. Prevalence of Bovine Sarcocystosis in Babylon province. *Kufa J. Vet. Med. Sci.* 3 (2).
- Oryan, A., Ahmadi, N. and Mousavi 2010. Prevalence, biology, and distribution pattern of Sarcocystis infection in water buffalo (*Bubalus bubalis*) in Iran. *SM. Trop. Anim. Health Prod.* 42(7):1513-1518.
- Retzlaff, N. and Weise, E. 1969. Sarkosporidien beim wasser buffel (*Bubalus bubalis*) in der turkey. Ber. Munch. Tierarztl. Wschr, 82: 283-286.
- Rommel, M. 1985. Sarcocystosis of domestic animals and hum In Practice, Sept. pp., 158 - 160.
- Scott, W. T. 1930. The Sarcosporidia a critical review. *J. Parasitol.*, 16 (3): 103 - 111.
- Xiao, B. N., Zhang, Y. S. and Yong, Z. F. 1988. A survey of sarcosporidiosis in domestic animals. *Chinese J. Vet. Med.*, 14:12-14.
- Yang, Z. Q., Zuo, Y. X., Ding, B., Chen, X. W., Luo, J. and Zhang, Y. P. 2001. Identification of *Sarcocystis hominis*-like (Protozoa: Sarcocystidae) Cyst in Water Buffalo (*Bubalus bubalis*) Based on 18S rRNA Gene Sequences. *J. Parasitol.* 87:(4) p. 934-937.
- Zhang, Y. H., and Zuo, Y. X. 1992. Ultrastructures of cysts of Sarcocystis in water buffalo and cattle. *Acta Zoologica Sinica.* 38:440-441.
- Zuo, Y. X., Chen, X. W., LI, Y. J., Ma, T. C., Tang, D.H., Fan, L.X. and Zhao, M, L. 1995. Studies on Sarcocystis species of cattle and water buffalo with description of a new species of Sarcocystis. Proceedings of the Tenth Anniversary of the Founding of the Chinese Parasitological Society, Chinese Scientific and Technical Publishing House, Beijing, People's Republic of China, 20 p.
