

RESEARCH NOTE

PREVALENCE AND DISTRIBUTION PATTERN OF *SARCOCYSTIS* SPP. INFECTION IN SLAUGHTERED CARABAOS AT SANTIAGO CITY ABATTOIR, PHILIPPINES

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ABSTRACT

The study was conducted to determine the prevalence and distribution pattern of *Sarcocystis* spp. infection in water buffalo carcasses since local news via television in Cagayan region reported an incident of condemnation of carcasses at Santiago City abattoir. A total of 1,015 newly slaughtered carcasses were grossly examined for the presence of macrocysts in the different muscles of the body. The prevalence and frequency distribution in terms of the sex, age, place of origin of the infected animals and the organs affected were expressed in terms of percentages. Fifty or (4.93%) of the 1,015 animal carcasses were found to be infected with macrocysts wherein 58% and 42% of which were found in female and male animals, respectively. Highest percentage of infection was observed in old age (42%), followed by the senile (36%), mature (20%) and young (2%) animals. The esophagus was found to be the most commonly affected organ (42/50 or 84%) by the macrocyst which was creamy white and oval and only 4% (2/50) was observed in striated muscles and 12% (6/50) in both the esophagus and striated muscles. Positive animals came from the different municipalities of Cagayan Valley, Philippines.

Key words: bubaline meat, macrocyst, prevalence, *Sarcocystis*, water buffalo

INTRODUCTION

Sarcocystis spp. is one of the most prevalent parasites affecting livestock (Dubey *et al.*, 1989; Badawy *et al.*, 2012). They are obligate two-host parasites that utilize wild and domestic animals like cattle, water buffaloes, swine, and birds as intermediate hosts, while carnivores including man serve as definitive host (Taylor *et al.*, 2007). Encystment to muscles may result in dysfunction of physiologic processes which may lead to serious effects (Nicolas *et al.*, 2016).

Sarcocystosis has been associated with economic losses due to abortions, stunted growth and death in cachectic stage of animals (More, 2005). Furthermore, it may pose a

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potential public health risk since some species of the parasite are zoonotic and can be acquired through consumption of undercooked meat of infected animals like cattle and pigs (Dubey *et al.*, 1989) which may result to nausea, vomiting, abdominal pain and diarrhea (Dubey *et al.*, 1989; Badaway *et al.*, 2012).

In the Philippines, cases of *Sarcocystis* spp. infection was reported in the Philippine buffalo (Manuel *et al.*, 1983; Nicolas *et al.*, 2016), cattle, swine (Claveria *et al.*, 1997) and goats (Claveria *et al.*, 2004) which were found virtually in all striated muscles of the body including the tongue, esophagus and diaphragm, as well as cardiac muscle and, to a lesser extent, smooth muscle (Kia, 2003; Oryan *et al.*, 2010). The occurrence of sarcocystosis in slaughtered water buffaloes at Santiago City abattoir has been reported in the Cagayan Valley local news. However, information on the prevalence of sarcocystosis and profiles of infected animals in terms of sex, age, organs affected as well as their origin are lacking, thus, this study was conducted. The Santiago City abattoir is an AA accredited abattoir in the Cagayan Valley region in 2012 and animals slaughtered from this abattoir are for local and inter-provincial distribution and sale in any meat market nationwide.

MATERIALS AND METHODS

Prior to slaughter via electrical stunning, the water buffaloes passed the ante-mortem examination performed by the meat inspectors of the abattoir. The study was conducted for a year from November 2012 to November 2013. The animals were from both sexes with age ranging from 4-28 years old. A total of 1,015 newly slaughtered carcasses were grossly examined for the presence of macrocysts in the different muscles.

The prevalence of *Sarcocystis* infection among slaughtered water buffaloes at Santiago City abattoir was determined by dividing the total number of animals with macrocysts with the total number of animals examined and multiplied by 100. The affected animals were classified into sex and different age ranges such as young (1-5 years old), mature (6-10 years old), old (11-15 years old) and senile (16 years old and above). The organs frequently affected with *Sarcocystis* cysts were ranked accordingly and frequency distribution in terms of sex, age ranges, organs affected and place of origins were expressed in percentages.

RESULTS AND DISCUSSION

Out of the 1,015 newly slaughtered water buffalo carcasses examined, 50 or 4.93% were found positive for macroscopic *Sarcocystis* cysts. The prevalence rates obtained in the study were relatively similar to the result of Arambulo *et al.* (1972) which is 4.90% while higher prevalence rate was reported by Manuel *et al.* (1983) which is 63.50%, and Claveria *et al.* (2000) which is 65.00%. In the reports of Manuel *et al.* (1983) and Claveria *et al.* (2000), the presence of both macroscopic and microscopic cysts in infected bubaline meat samples were considered which may explain the higher prevalence rates of their study as compared to the lower prevalence rate obtained in this study which identified macrocysts through visual inspection at post-mortem only. Nevertheless, the study confirms the consistent presence of *Sarcocystis* spp. in water buffaloes in the Philippines.

Table 1 presents the frequency distribution of infected bubaline meat as to age and sex. Of the 50 meat samples with visible macroscopic cysts, 29 (58%) were from female

water buffaloes and 21 (42%) were males. The result of this study is in contrast to the findings of Arambulo *et al.* (1972) and Manuel *et al.* (1983) who reported a higher prevalence rate of *Sarcocystis* infection in males than in females while Oryan *et al.* (2010) and Claveria *et al.* (1997) reported no significant difference with regards to sex of the animals infected by *Sarcocystis*.

As seen in Table 1, among the animals examined, old age had the highest percentage of infection which was 42% followed by the senile (36%), mature (20%) and young (2%). This result can be attributed to the immunological state of the host which can influence the distribution of the *Sarcocystis* cysts. The higher percentage of infection in old animals may be explained by their lower immunity since younger and old animals, animals in stressed condition and those with existing infection have weaker immunity to infection. Moreover, in advancing age, animal innate, cell- mediated and humoral immune response decline resulting in increased susceptibility to infection (Tizard, 2009). Also, these mature animals are more often used for draft purposes which may contribute to their stressed condition. This may also be due to the fact that most of the water buffaloes sold for slaughter are the old ones when they become inefficient for draft work.

Although most *Sarcocystis* infections in animals are subclinical (Lindsay *et al.*, 1995) the severity is dependent on the number of sporocysts ingested. The immune status of the host must be overcome by the number of sporocysts before the development of clinical disease (More, 2005). A depressed immune system may result in massive generalized distribution of *Sarcocystis* cysts with only a small number of sporocysts ingested.

The esophagus was found to be the most commonly affected organ (42/50 or 84%) with *Sarcocystis* cysts. Only 4% (2/50) was observed in striated muscles, whereas 12% (6/50) was observed both in the esophagus and striated muscles. This predominance of sarcocysts in esophageal muscles (Figure 1) correlates with the reports in the Philippine carabao of Tongson and Molina (1879) as cited by Manuel *et al.* (1983), Manuel (1983) and Claveria *et al.* (1997). The esophagus remains to be the most reliable site to detect the presence or absence of macrocysts in newly slaughtered carabaos.

The presence of the cysts was also validated through histopathologic examination of the affected muscles which showed muscle fiber degeneration and with several microcysts (Figure 2).

Figure 3 shows a choropleth map of the place of origin of the *Sarcocystis*-infected

Table 1. Frequency distribution (%) as to age range and sex distribution of the 50 infected heads of bubaline meat.

Bubaline Infected	No. of Females Infected, %	No. of Males Infected, %	Age Range (Yrs), %
Young (1-5 years)	2	0	ARH1 = 2
Mature (6-10 years)	12	8	ARH2 = 20
Old (11-15 years)	24	18	ARH3 = 42
Senile (16 years and above)	18	18	ARH4 = 36
Total	58	42	---

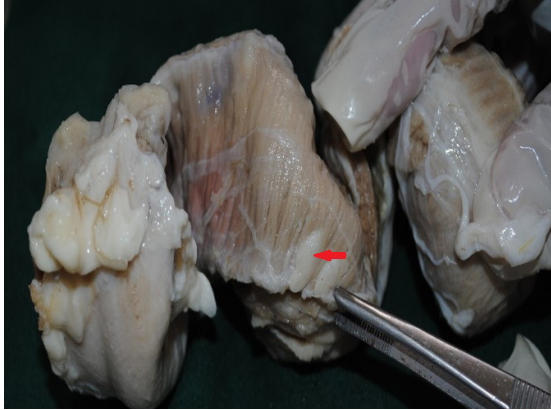


Figure 1. Creamy white fusiform macroscopic *Sarcocystis* cyst found in the esophageal muscles (red arrow).

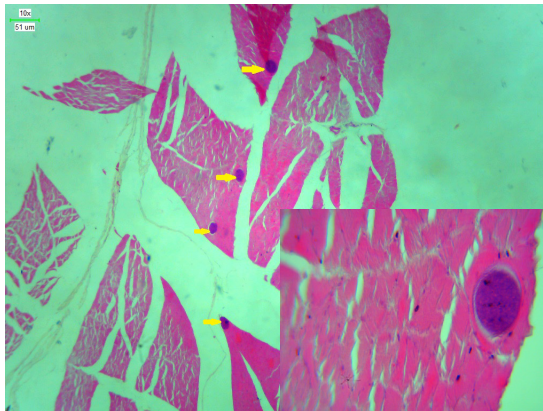


Figure 2. Several microcysts found in the esophageal muscle fibers (yellow arrows), inset shows higher magnification showing a microcyst with capsule.

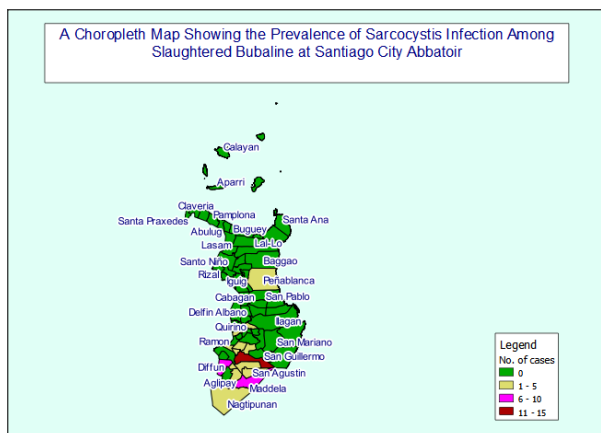


Figure 3. A choropleth map showing the place of origins of *Sarcocystis* spp. infected bubaline meat at Santiago City abattoir.

bubaline meat. The water buffaloes that were brought for slaughter in the Santiago City abattoir during the time of study came from the different municipalities not only from the province of Isabela (62%) but as well as the nearby provinces like Quirino (36%) and Cagayan (2%). The higher percentage of infected carcasses from Isabela may be explained by the higher number of animals from Isabela that are brought for slaughter to the Santiago City abattoir which is located at Isabela province. This data may also show that *Sarcocystis* infection is present in the whole Cagayan Valley.

CONCLUSION

Among the 1,015 bubaline carcasses examined, 4.93% (50) were found positive with macroscopic sarcocysts wherein 58% and 42% of which were found in female and male animals, respectively. The highest percentage of infection was observed in old age (42%), followed by the senile (36%), mature (20%) and young (2%). The esophagus was found to be the most commonly affected organ (42/50 or 84%) by the macrocyst. Only 4% (2/50) was observed in striated muscle and 12% (6/50) in both the esophagus and striated muscles. The macrocysts observed were creamy white in color with fusiform or oval shape in the esophagus and rice grain in appearance in the skeletal muscles. Also, it was found out that these macrocyst-positive animals came from the different municipalities not only of Isabela but also from the whole Cagayan Valley.

Further studies can be conducted to identify the species of the parasite present as well as the associated risk factors with *Sarcocystis* spp. infection since some species are zoonotic in nature and thus, prevent its transfer to humans.

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