

*Sarcocystis hirsuta* (Protozoa, Apicomplexa)  
in Cattle in Japan

ISAMU INOUE, CHIEKO YAMADA<sup>1)</sup>, MASAJI YAMADA<sup>2)</sup>, TOHSHI KONDO<sup>1)</sup>

(Accepted for publication; June 25, 1990)

**Key words:** Cyst wall, *Sarcocystis hirsuta*, cattle

Three species of the genus *Sarcocystis* have been reported in cattle: *S. cruzi* (Dubey et al., 1989); *S. hirsuta* (Moulé, 1888); and *S. hominis* (Dubey et al., 1989). In Japan, Ikegami et al. (1966), Saida et al. (1977), Yamada et al. (1982), Mori (1985), Shimura et al. (1982) and Nakamura et al. (1982) have reported on the incidence of bovine *Sarcocystis*. Although those reports detailed the distribution and pathology of *S. cruzi* in Japan, no attempts were made to identify other species of bovine *Sarcocystis*. This paper deals with the identification of *S. hirsuta* in cattle in Japan.

This study was performed in May, 1989. Sarcocysts were obtained from 30 cattle, 11 Japanese Black and 19 Holsteins, which were slaughtered in the abattoirs of Nagoya city, Aichi Prefecture. The sarcocysts were isolated from the cardiac and masseter muscles of individual animals. The tissues were minced with scissors, then digested by incubation in 0.5% (w/v) trypsin solution for 30 min at 37°C. The digested suspension was homogenized at 1,000 rpm for 30 sec, and the sarcocysts isolated under a light microscope. In addition, squash preparations of small pieces of tissue were examined from each

sample. Histological preparations were obtained by routine procedures, i.e., fixation of tissues in 10% (v/v) formalin, embedding in paraffin and staining sections with hematoxylin and eosin (H-E). All steps were carried out using routine laboratory procedures.

Sarcocysts were detected in 5 of 11 (45.5%) Japanese Black cattle and 12 of 19 (63.2%) Holsteins. The location of the sarcocysts was 56.7% (17/30) in cardiac muscle and 53.3% (16/30) in the masseters.

Two different types of Sarcocyst were observed. Sarcocysts with a thin cyst wall (type-A) were detected in 16 cattle (5 Japanese Black and 11 Holsteins) and those with a thick cyst wall (type-B) were detected in 4 cattle (2 Japanese Black and 2 Holsteins). One Holstein had only type-B sarcocysts, whereas three cattle were observed with both type-A and type-B sarcocysts.

Type-A sarcocysts were elliptical in shape. Those isolated from the cardiac muscle (n = 63) averaged  $472.3 \times 112.1 \mu\text{m}$  in size, while those recovered from the masseter muscles (n = 63) averaged  $550.2 \times 98.0 \mu\text{m}$ . The protrusions of cyst wall were below  $1 \mu\text{m}$  in length. Bradyzoites were crescentic in shape, measuring  $14.1 \times 4.4 \mu\text{m}$  (n = 200).

Type-B sarcocysts were longer. The size of sarcocysts isolated from the cardiac muscle (n = 10) averaged  $616.1 \times 60.6 \mu\text{m}$  and  $823.2 \times 76.1 \mu\text{m}$  from the masseter muscles (n = 10). The protrusions of cyst wall were 2.5 to  $7.5 \mu\text{m}$  in length and villi-like in shape. Bradyzoites were crescentic in shape, measuring  $16.2 \times 3.2 \mu\text{m}$

Department of Medical Zoology and <sup>2)</sup>Biomedical Science, College of Agriculture and Veterinary Medicine, Nihon University, 1,866 Kameino, Fujisawa-shi, Kanagawa 252. <sup>1)</sup>Nagoya Meat Hygiene Inspection Laboratory, 1-202 Kamitakahata, Nakagawa-ku, Nagoya-shi, Aichi 454, Japan

井上 勇 (日本大学農獣医学部医動物学研究室)  
山田千恵子 近藤東師 (名古屋食肉衛生検査所)  
山田政治 (日本大学農獣医学部実験動物学研究室)

from the cardiac muscle ( $n = 100$ ) and  $15.1 \times 3.3 \mu\text{m}$  from the masseter muscles ( $n = 100$ ). Sarcocysts obtained from the cardiac muscle were slightly smaller than those from the masseter muscles.

The cyst of *Sarcocystis cruzi* has a thin cyst wall, elliptical in shape and  $< 500 \mu\text{m}$  in length. Therefore type-A sarcocysts closely approximated *S. cruzi* morphologically. On the other hand, *S.*

*hirsuta* has a thick cyst wall, is longer and more elliptical in shape, and measures  $8000 \times 1000 \mu\text{m}$  in naturally infected and  $800 \times 80 \mu\text{m}$  in experimentally infected cattle. In addition, the structure of cyst wall is villi-like protrusion and 3 to 6  $\mu\text{m}$  in length. *S. hominis* has a thick cyst wall, which is composed of palisade-like protrusions up to 7  $\mu\text{m}$  in length.

Type-B sarcocysts are clearly distinguishable

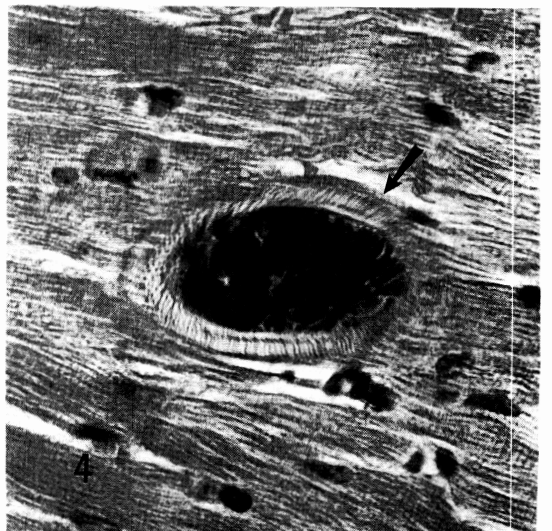
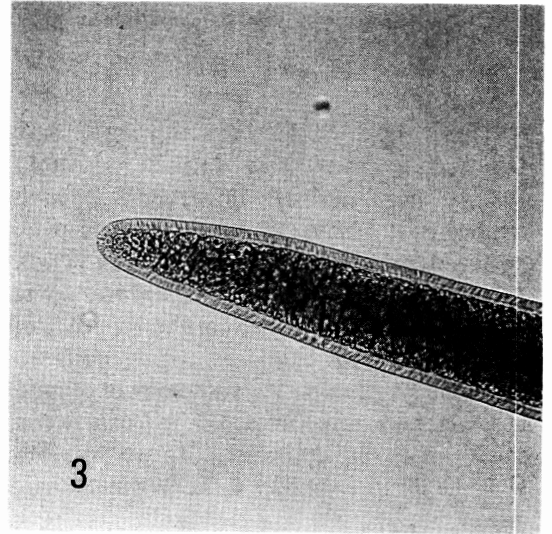
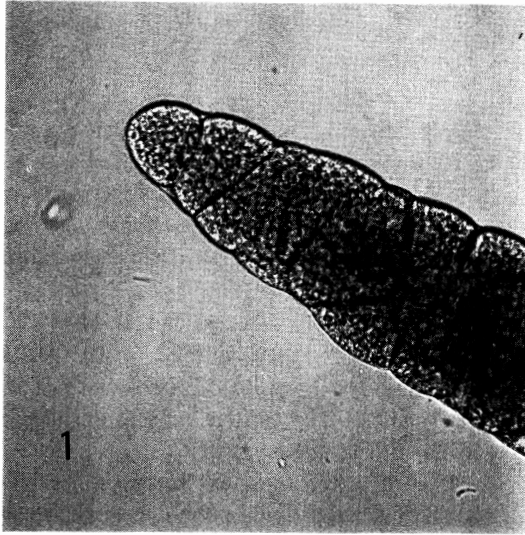


Fig. 1 Fresh sarcocyst (type-A) of *S. cruzi* in cardiac muscle, showing thin cyst wall.  $\times 40$

Fig. 2 Thin-walled sarcocyst (type-A) of *S. cruzi* in cardiac muscle. H-E,  $\times 50$

Fig. 3 Fresh sarcocyst (type-B) of *S. hirsuta* in cardiac muscle, showing thick cyst wall,  $\times 20$

Fig. 4 Thick-walled sarcocyst (type-B) of *S. hirsuta* in cardiac muscle, showing villi-like protrusions (arrow). H-E,  $\times 200$

from *S. cruzi* (type-A) by its characteristic thick cyst wall. *S. hominis* differs from *S. hirsuta* in its palisade-like protrusions.

As mentioned above, the *Sarcocystis* type-B cysts isolated in this experiment coincided with *S. hirsuta* in the size and shape of the Sarcocysts, and in the structure of the cyst wall. Hence, the *Sarcocystis* species isolated from the slaughtered cattle was identified as *Sarcocystis hirsuta* moulé, 1888. This is the first report that deals with *S. hirsuta* detected in the cattle of Japan. However more detailed studies should be made to clarify whether or not only two species, *S. cruzi* and *S. hirsuta*, are present in Japan, because were examined in this study only 30 cattle.

#### Acknowledgements

The authors wish to thank Professor Dr. H. Mehlhorn of the Institut für Spezielle Zoologie und Parasitologie, Ruhr-Universität Bochum, West Germany, for valuable advice.

#### References

- 1) Dubey, J. P., Speer, C. A. and Faver, R. (1989): Sarcocystosis of Animal and Man. CRC Press, Florida, 105–112.
- 2) Ikegami, T., Tokutomi, G., Tanaka, K. and Uchida, K. (1966): Bull. Inst. Public Health, 15, 155–159.
- 3) Mori, Y. (1985): Studies on the *Sarcocystis* in Japanese black cattle (in Japanese). Bull. Azabu Univ. Vet. Med., 6, 51–65.
- 4) Moulé, L. T. (1888): Des sarcosporides et de leur fréquence, principalement chez les animaux de boucherie. Soc. Sci. Arts Vitry le-Francois. 14, 3.
- 5) Nakamura, K., Shoya, S., Nakajima, Y., Shimura, K. and Ito, S. (1982): Pathology of experimental acute Sarcocystosis in a cow. Jpn. J. Vet. Sci., 44, 675–679.
- 6) Saida, K., Hoshino, T., Koyama, T. and Fukuda, F. (1977): J. Vet. Med., 671, 340–343 (in Japanese).
- 7) Shimura, K., Ito, S. and Tsunoda, K. (1982): An experimental infection of a cow with *Sarcocystis cruzi*. J. Jpn. Vet. Med. Assoc., 35, 647–652 (in Japanese with English summary).