



Short Communication

***Cysticercus bovis* infection in slaughtered cattle in Mashhad abattoir**

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Summary

Cysticercus bovis, the larval stage of the beef tapeworm *Taenia saginata*, occurs mainly in young calves via ingestion of the worms' eggs excreted in the feces of infected persons. The most heavily infected muscles include heart, masseters, shoulder, and tongue. In February 2021, during abattoir meat inspection at Mashhad abattoir, *Cysticercus bovis* cysts ranging from 0.5 to 1 cm were detected in striated muscles of 22 / 33 (66.66%) of Holstein bulls of 1-2 years old originating from one farm that located in Qom province. This is the first report of bovine cysticercosis in slaughtered cattle in Mashhad abattoir. However, this case report shows zoonotic importance of *C. bovis* infection and meat inspection, improving personal and environmental hygiene are the most important measures to decrease bovine cysticercosis.

Keywords: *Cysticercus bovis*, tissue cyst, cattle, Iran.

Introduction

Cysticercus bovis, as *T. saginata* larve, is formed in the striated muscles of cattle as intermediated host after ingestion of *T. saginata* eggs. The size of *C. bovis* with invaginated scolex reaches 5-10 mm in diameter. It remains alive and active for one year, and then it gradually becomes calcified (Arfaa, 1989; Eslami, 1997). Human is the definitive host and is infected with adult *T. saginata* after ingestion of infected raw or undercooked meat to *C. bovis*. The scolex of cysticercus is released and attached to the small intestine mucosa of human. It grows and changes to *T. saginata*, which reaches up to ten meters in

the small intestine. The *T. saginata* infection causes diarrhea, abdominal pain, weight loss, chronic hunger, sensitivity, nausea, and dizziness in humans (Afraa, 1989). Routine meat inspection is generally the only diagnostic tool that is used for *cysticercus bovis* infection (Eslami, 1990). In Iran, the frequency of *C. bovis* infection was detected at 0.3 - 7.7% in Fars province (Oryan et al., 1995; Oryan et al., 2012), 3% of cattle in Ardabil (Garadaghi et al., 2012); 0.95% of cattle in Isfahan province (Hosseinzadeh et al., 2013), 0.03-0.07% of cattle in Kermansh province (Faraji et al., 2015; Hashemnia et al., 2015), and 1.7% of cattle in Tabriz province (Mirzaei et al., 2016). Here in, we

report the occurrence of *C. bovis* infection in slaughtered cattle in Mashhad abettor.

Material and Methods

In February 2021, a batch of Holstein bulls, approximately 1-2 years old, was slaughtered in Mashhad slaughterhouse. During post-mortem examination, many carcasses were suspected to be infected with *C. bovis*. Many cysts with a diameter of 0.5 to 1 cm were found in the heart and the surface and depth of skeletal muscles in many care cases. Muscle samples of each carcass were submitted to the laboratory for parasitology examination. The viable cysts of muscles were dissected from muscle tissue using forceps and scissors and transferred into a petri dish containing saline solution. After slitting the cysts with a scalpel, the contents of the cysts were carefully observed under the stereo microscope. The scolex

of each sample was placed in a drop of lactophenol on the slide and covered with a coverslip. The slide was incubated at 37 °C for 60-90 minutes. The cleared temporary mounts were examined under a light microscope.

Results

Of the 33 slaughtered cattle, 22 (66.6%) were suspected to be infected with cysticerci. Gross examination of the muscle samples showed the presence of white-colored cysts at 5-10 mm diameter on the surface and depth of the muscles (Figures 1 and 2). Some of the cysts were degenerated or mineralized. Cysts of all muscle samples were microscopically identified as *C. bovis* based on having a scolex with four suckers and a short neck without rostellar hooks (Figures 3 and 4).

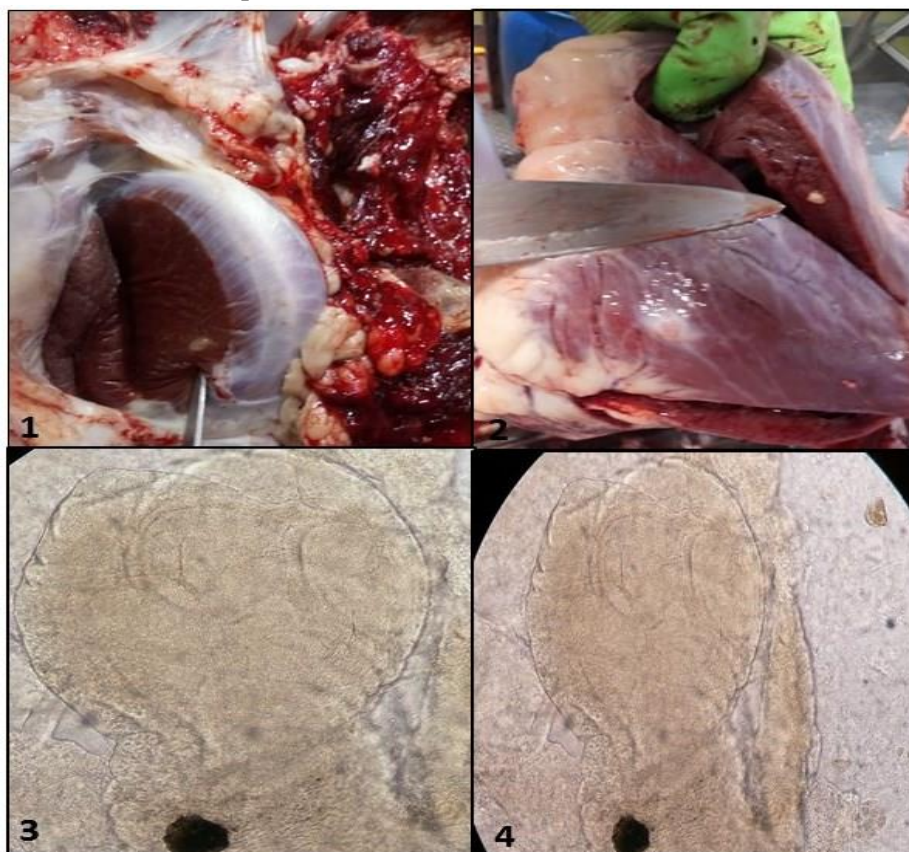


Fig.1. Viable *C.bovis* in heart muscle. **Fig.2.** Fibrotic *C.bovis* in heart muscle. **Fig. 3.** Scolex of *C.bovis* (×400)
Fig. 4. Scolex of *C.bovis* (×100).

Discussion

Despite post- mortem examination of carcasses at slaughtered houses, bovine cysticercosis remains

an important zoonotic disease in Iran (Moazeni et al., 2019). In this report, we found that 66.6% (22/33) of bull carcasses were infected with *C.bovis*. In Iran, the range of bovine cysticercosis prevalence was usually reported to be between 0.5 to 7.7% in cattle (Moazeni et al., 2019). However, the highest prevalence of bovine cysticercosis was reported in slaughtered cattle in Caspian area (52%; Thornton, 1952) and 23% in slaughtered cattle in Arak area (Gholami et al., 2020). Two epidemiological patterns have been reported in developing and developed countries (Taylor et al., 2007). In developed countries such as Europe, North America, Australia, and New Zealand, the prevalence of cysticercosis is low as the standard sanitation is high and meat is carefully inspected. The prevalence of bovine cysticercosis was below 6.2% in many European countries (Laranjo-González et al., 2016). Despite the remarkable progress made in the control of bovine cysticercosis in these countries, several outbreaks were reported with an infection rate of 42.8-50.9% in Canada (McAninch, 1974; Bundza et al., 1988), 58% in Australia (Jenkins et al., 2013), and 65% in New Zealand (McFadden et al., 2012). The occurrence of cysticercosis storms can be associated with to use of human sewage on pasture as a fertilizer in the form of sludge and the use of migrant labor from a country with a high prevalence of infection. In contrast to the epidemiology of developing countries, cattle of any age are susceptible to infection (Taylor et al., 2007). In developing countries including many parts of Africa, Asia, and Latin America, cattle are reared on an extensive scale, whereas human sanitation is poorly developed and the incidence of human infection with *T. saginata* is high and calves are usually infected in early life (Taylor et al., 2007). The moderate prevalence of *C. bovis* infection has been reported in Latin America (0.1–19%; Braae et al., 2018) and in the Middle East and North Africa (0.2-20%; Saratsis et al., 2020). The high prevalence of *C. bovis* ranged has been reported in East, South and South East Asia (i.e., 0.76–46.7%; Eichenberger et al., 2020) and in South and East Africa (i.e., 6.1-34.9%; Dermauw

et al., 2018). In the present study, the breeding place of the slaughtered cattle was not determined, but they were shipped to Mashhad slaughterhouse from Qom province. Recently, a similar outbreak with a high prevalence has been reported in slaughtered cattle in Arak area, Markazi province (Gholami et al., 2020), where *T. saginata* eggs were detected in the fecal sample of a former worker, who was working during the outbreak of bovine cysticercosis.

Conclusion

Despite post- mortem examination of carcasses at slaughtered houses, bovine cysticercosis remains an important zoonotic disease in Iran. It seems that infected human feces are also as a source of this outbreak. However, the health of the workers should be approved by the health departments through clinical and paraclinical examinations. In addition, basic health training about personal hygiene and proper disposal of excreta should be given to the farm workers.

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Conflict of interest statement

The authors declare no conflict of interest.

Ethical approval

Not applicable.

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