INTRODUCTION

*Taenia serialis* is a rare and neglected taeniid parasite. Adult *T. serialis* is parasitic in the small intestine of the definitive hosts (dogs, foxes, and other canids), and *T. serialis* larvae develop in the subcutaneous tissues and intramuscular connective tissues of the intermediate hosts (rabbits, hares, rodents, horses, cattle, sheep, goats, and even primates) [1-5]. Coenurosis just is an infection by the metacestode larval stage (coenurus) of *T. serialis*, which usually presents as painless nodules in the parasitic parts of body, so the infection prevalence of *T. serialis* worldwide is likely underestimated [2,5]. *T. serialis* coenurus is characterized by a large and more tissue-compressing cyst, which contains only a single protoscolex [1,6]. Humans cannot be a definitive host for this species of tapeworm, but they can act as an intermediate host. Human *T. serialis* coenurus occurs when humans accidentally ingest these eggs, usually in contaminated water and fruits or vegetables [7]. In addition, when *T. serialis* coenurus is found in the central nervous system (CNS), larval cestode parasites may cause an array of unpleasant symptoms: seizures, ataxia, and further neurological symptoms [8,9]. The first proven case of human coenurus due to *T. serialis* was reported in a 59-year-old French woman by Bonna and colleagues in 1933, and the first infection in the Western Hemisphere was reported in 1950 in a 2-year-old California boy (available in https://web.stanford.edu/group/parasites/ParaSites2005/Coenurosis/). Recently, a *T. serialis* infection was identified in an African patient (man) from Nigeria with the parasitic larva located subcutaneously on the lower jaw confirmed by molecular tools [1].

Therefore, we performed the present study with morphological and molecular methods to identify the cystic metacestode incidentally recovered from a carcass of a wild rabbit in the Qinghai Tibetan Plateau Area (QTPA), China.

CASE RECORD

A carcass of 2-year-old male wild rabbit (*Lepus sinensis*) was found and then dissected by a local veterinarian. A total of 6 cystic metacestodes were found in the abdominal muscles of a wild rabbit, *Lepus sinensis*, in China. The coenurus contained one or more scolices armed with hooklets. Mitochondrial cox1 (1,623 bp) confirmed 98% homology with cox1 of *Taenia serialis*. This is the first report of *T. serialis* infection in an intermediate host in the Qinghai Tibetan Plateau Area, China.

Key words: *Taenia serialis*, coenurus, rabbit, cox1, China

**A Case of Coenurosis in a Wild Rabbit (*Lepus sinensis*) Caused by *Taenia serialis* Metacestode in Qinghai Tibetan Plateau Area, China**

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**Abstract:** Six cystic metacestodes were found in the abdominal muscles of a wild rabbit, *Lepus sinensis*, in China. The coenurus contained one or more scolices armed with hooklets. Mitochondrial cox1 (1,623 bp) confirmed 98% homology with cox1 of *Taenia serialis*. This is the first report of *T. serialis* infection in an intermediate host in the Qinghai Tibetan Plateau Area, China.

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many), according to the manufacturer’s instructions. A PCR was performed to amplify a fragment of the cytochrome c oxidase subunit 1 (cox1) of the mitochondrial genome. The expected lengths obtained after amplification employed the primers *T. serialis-cox1* F: 5’-TTTCGTGTCAATTTGGTTT-3’ and *T. serialis-cox1* R: 5’-GCATGATGCAAAAGGCAAAT-3’, the products were 1,844 bp. The PCR were performed in standard mixtures of 50 μl containing 4 μl primer mixtures (10 μM of each primer), 2 μl dNTP Mix (10 mM of each dNTP), 5 μl 10×PCR Buffer containing 1.5 mM MgCl₂, 3 μl 3 mM MgCl₂, 0.5 μl 5 U HotStar Taq DNA polymerase (Qiagen Gmb H, Hilden, Germany), 2 μl DNA and 33.5 μl PCR-Grade water. The amplification reactions were run according to the following PCR program: an initial heat-activation step at 95°C for 15 min; 35 cycles of 94°C for 45 sec, 54°C for 1 min, and 72°C for 2 min; then 72°C for 10 min and a final hold at 4°C. The amplification PCR products were analyzed using 1.5% agarose gel containing ethidium bromide (0.6 mg/ml) and were observed under UV light.

The positive PCR products were directly sequenced by BEI-

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**Fig. 1.** Coenurus in tissue specimens, stained with hematoxylin and eosin. Images taken at 40× magnification (A1, B1, C1, and D1), 100× magnification (A2, B2, C2, and D2), 400× magnification (A3, B3, C3, and D3). Blue arrows point hooklets in the protoscolices.
To identify the parasite species, the molecular biology identification was essential. Recently, only one study used molecular method to diagnose a coenurosis in a man from Nigeria and the pathogen identified as *T. serialis* [1].

In this study, the cysts were found in the muscle of the rabbit, without presentation in the rest of the body or in the eyes-exophthalmos [10]. So it was therefore difficult to diagnose coenurosis, but in general the cysts could be identified as *Taenia* or *Multiceps serialis* morphologically. In previous studies, the scolex arrangement and the number and size of rostellar hooks were used for the identification [4,11], and the morphology of the hook guards were also applied to assist in the identification [4,12]. The cysts’ morphological identification would be indicative of a *T. serialis* infection, following the molecular biological confirmation of *T. serialis* from a characteristic cyst in a wild rabbit that could be further strengthened. Previously, some authors declined to assign a determined species in their studies [13,14], while the others attributed coenurosis infection to *T. serialis* or *T. multiceps* based on the morphological analysis, which is still not very accurate method to assign the exact parasites species. Morphological identification methods are rapid and convenient assays and it is easy to decipher the results, however, it also has a few shortcomings that are inconsistent. In order to further prove the parasite species, the molecular biology identification was essential. Recently, only one study used molecular method to diagnose a coenurosis in a man from Nigeria and the pathogen identified as *T. serialis* [1].

In conclusion, this is the first report of *T. serialis* infection in rabbit in QTPA, China, which indicates the definitive hosts and intermediate hosts of *T. serialis* live in the same environment and area. Further studies should carry out to determine the prevalence of *T. serialis* in definitive hosts and intermediate hosts. Although there is only fragmented record of the occurrence and distribution of *T. serialis*, then which is with a poten-

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**DISCUSSION**

Coenurosis is an uncommon but serious zoonosis, it is often neglected because of its painless nodules in the skin or subcutaneous tissue. However, people have realized the danger of this disease, when it is parasitic in the eyes and the central nervous system. Although it is estimated, that the prevalence of coenurosis in humans is not very high without real “endemic” area. However, *T. serialis* coenurosis occurs in animals worldwide, with a focus on Europe, Africa, the Middle East and the Americas [5], and the parasite is propagated in a predator-prey cycle that involves definitive hosts (dogs, foxes and other canids) and intermediate hosts (rabbits, hares, and other rodents) [1,2].
tional underestimation of its zoonotic potential and importance to public health concerns.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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