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A survey of canine echinococcosis in Gobi Altai Province of Mongolia by coproantigen detection

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Abstract

Few studies have been carried out for the prevalence of canine echinococcosis in Mongolia. This study was designed to elucidate a preliminary information of the prevalence from feces collected in the field. Sixty-seven fecal samples from dogs and 2 red foxes in Altai town were collected and examined for *Echinococcus* coproantigen and eggs. Coproantigen detection was performed by a sandwich ELISA using a monoclonal antibody EmA9 raised against *Echinococcus multilocularis* somatic antigen. Of the dog samples examined, 17 (25.4%) were positive by the ELISA. One out of two foxes was positive, too. Taeniid egg-positive feces were recognized in 12 dog feces. Only 6 samples were both coproantigen and egg positive. Eggs of *Ancylostoma* sp., *Trichuris* sp., and *Capillaria* sp. ; were also registered.

Key words : coproantigen, echinococcosis, Mongolia

Echinococcosis that caused by *Echinococcus granulosus* is of considerable economic and public health importance in Mongolia. Human cases have been registered in all Provinces among both rural and urban residents⁵⁾. Wolves and dogs have been reported

as definitive hosts^{2,5)} and the list of intermediate hosts included almost all the species of wild and domestic ungulates in Mongolia¹³⁾.

An accurate diagnosis of *E. granulosus* infection in the definitive hosts has always been one of the most important components

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for establishing epidemiological parameters of this disease¹¹. However, very little comparative work has been done on hydatid infection in wild and domestic carnivores in Mongolia. Existing reports on the prevalence in Mongolia are based on the postmortem examination of the stray dogs only^{3,5}. Diagnosis of echinococcosis in the definitive host through detection of the coproantigen has been recently performed in some endemic countries. Coproantigen detection corresponds to the presence of worms in the intestine and is a good tool for diagnosis of infected dogs^{1,4,8}. Monoclonal antibody, EmA9, raised against *E. multilocularis* adult worm somatic antigens produced by Kohno et al.⁸ has been reported to be useful for the coproantigen detection of *E. granulosus*^{9,11}.

In this study we tried to elucidate a preliminary information of the prevalence of canine echinococcosis from feces collected in a rural town of Mongolia using the coproantigen detection method¹⁰. The study area is Altai town of Gobi Altai Province, Mongolia. The Province is situated in the south-west of Mongolia, inhabited by 72,000 people and 2.1 million of livestock. The territory is 142,200 km², large part of which is covered by deserts and mountains. The main activity of the rural population is an animal husbandry. Altai town is the center of the Province and has population of 20,000.

Twenty seven fecal samples were collected from 27 pet dogs and 40 fecal samples of stray dogs were collected at the sites where stray dogs were often observed in Altai town. Two rectal feces of wild red foxes (*Vulpes vulpes*) were also collected from the captured foxes in the town. The samples were first examined on the presence of helminth eggs and then were used for coproantigen detection by enzyme-linked immunosorbent assay (ELISA). All fecal samples were mixed with

1% formalin solution in the collection vial with screw cap and heated for at least 12 hours at 72° C. Each vial was weighed and fecal weight was calculated. Parasite egg examination was conducted by the sucrose centrifugal flotation technique with a sucrose solution of specific gravity 1.27. For the coproantigen detection, fecal mixture was diluted to the final concentration of 0.5 gram feces in a total volume of 15 ml 1% formalin containing 0.3% Tween 20. The sample was then shaken vigorously by hand to form slurry and centrifuged at 2000 g for 10 minutes at room temperature. The supernatant was used for the coproantigen detection assay and the sediment used for egg examination. Coproantigen detection assay was performed as described by Morishima et al.¹⁰. A cut off value to determine positive and negative was calculated to be 0.179 which is the mean OD value plus 3 S.D. of fox negative samples.

Results of the sandwich ELISA versus occurrence of taeniid eggs in 67 dog feces are shown in Table 1. Seven out of 27 pet dogs (25.9%) and 10 out of 40 (25.0%) stray dogs examined were coproantigen positive. One out of two samples from red foxes was positive. The taeniid egg-positive feces were collected from 12 dogs, including two from pet dogs and 10 from stray dogs. Of the 17 (25.4%) samples positive by the sandwich ELISA, only 6

Table 1. Comparison of coproantigen detection and taeniid egg examination of the dog fecal samples in Altai town (Gobi Altai Province, Mongolia).

Taeniid egg	Coproantigen		Total
	Positive	Negative	
Positive	6	6	12
Negative	11	44	55
Total	17	50	67

were taeniid egg positive. Parasite eggs other than those of taeniid cestodes found in dogs included *Ancylostoma* sp., *Trichuris* sp., and *Capillaria* sp. Because, the eggs of *E. granulosus* could not be distinguished from those of other taeniid species, species identification was not provided.

In this study we did not determine the sensitivity and specificity of the sandwich ELISA, because the present results were not confirmed by postmortem examination of the dogs. The mAb (EmA9)-based coproantigen assay used in this study was reported to scarcely cross-react with supernatants of feces collected from dogs and cats infected with *Taenia crassiceps* and *T. taeniaeformis*, respectively¹²⁾, although Malgor et al.⁹⁾ revealed that coproantigen of mature and patent *T. hydatigena* showed weak cross-reaction in the assay used. In Mongolia, dogs are reported as definitive hosts for *E. granulosus*, *T. crassiceps*, *T. hydatigena*, *T. pisiformis*, *T. multiceps*, *T. gaigeri*, *T. serialis*, *Dipylidium caninum*, *Toxascaris leonina* and *Macracanthorhynchus catulinus*^{2,3)}. Therefore, probability of cross-reaction with coproantigens of *T. hydatigena* and other *Taenia* species should be taken into consideration. Comparison of the coproantigen detection with fecal egg examination showed that only 6 samples were positive by both methods. Of the taeniid egg positive samples 6 were coproantigen negative, and eggs were not found from 11 coproantigen positive fecal samples. The former may indicate infection of taeniid species other than *Echinococcus* or *T. hydatigena*. The latter may indicate higher sensitivity of the coproantigen detection assay than fecal examination of eggs. Of special interest here is a positive sample from red fox. Since red foxes rarely harbor *E. granulosus*⁷⁾, the possibility of incidence with *E. multilocularis* should be taken into consideration. To date, *E.*

multilocularis have not been reported in Mongolia⁶⁾. Prevalence of *E. granulosus* was reported 5-16.9% in stray dogs in Mongolia^{2,3,5)}. Coproantigen prevalence (25.4%) in dogs in the study area can be considered high. Establishments of private ownership of livestock and abolition of the state run farms in Mongolia largely affected veterinary services and increased environmental pollution by invasive agents. Due to lack of financial resources in both state and newly established private enterprises, the state-ordered dehelminthization program is not more implemented. To date, only infectious disease control is being performed. Repeated use of the pastures by the growing number of livestock are not only causing overgrazing but contamination by invasive agents, too. Despite sharp increase of livestock population the provincial slaughterhouses and other small factories were closed; animals slaughtered without any veterinary control and dogs have ready access to offal. Therefore, the prevalence of echinococcosis might be considered much higher among shepherd dogs. The current status of the echinococcosis in the Province is not known. Only 3 patients were diagnosed with cystic echinococcosis and took surgery treatment. However, in the neighboring Province of Hovd and Bayan Ulgii, serological prevalence of antibodies against *E. granulosus* antigen B among semi-nomadic pastoralist reported 5.2%¹¹⁾. Further studies are required to determine the prevalence of echinococcosis in both definitive and intermediate hosts.

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