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▣ BRIEF COMMUNICATION

Prevalence of Intestinal Helminth Infections in Dogs and Two Species of Wild Animals from Samarkand Region of Uzbekistan

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Abstract: This study aimed to determine the prevalence of intestinal helminth parasitic infections and associated risk factors for the human infection among the people of Samarkand, Uzbekistan. Infection status of helminths including *Echinococcus granulosus* was surveyed in domestic and wild animals from 4 sites in the Samarkand region, Uzbekistan during 2015-2018. Fecal samples of each animal were examined with the formalin-ether sedimentation technique and the recovery of intestinal helminths was performed with naked eyes and a stereomicroscope in total 1,761 animals (1,755 dogs, 1 golden jackal, and 5 Corsac foxes). Total 658 adult worms of *E. granulosus* were detected in 28 (1.6%) dogs and 1 (100%) golden jackal. More than 6 species of helminths, i.e., *Taenia hydatigena, Dipylidium caninum, Diplopylidium nolleri, Mesocestoides lineatus, Toxocara canis*, and *Trichuris vulpis*, were found from 18 (1.0%) dogs. Six (*T. hydatigena, Toxascaris leonina, Alaria alata, Uncinaria stenocephala, D. caninum*, and *M. lineatus*) and 2 (*D. nolleri* and *M. lineatus*) species of helminths were also detected from 5 Corsac foxes and 1 golden jackal, respectively. Taeniid eggs were found in 2 (20%) out of 10 soil samples. In the present study, it was confirmed that the prevalences of helminths including *E. granulosus* are not so high in domestic and wild animals. Nevertheless, the awareness on the zoonotic helminth infections should be continuously maintained in Uzbekistan for the prevention of human infection.

Key words: *Echinococcus granulosus*, dog, wild animal, helminthic parasite, Samarkand, Uzbekistan

Human cystic echinococcosis (CE) is generally an endemic disease, mainly occurring in pastoral areas worldwide. The most important pathogen in humans is believed to be *Echinococcus granulosus* sensu stricto (s.s.), a synanthropic cestode that uses domestic dogs as definitive hosts and mainly sheep as intermediate hosts [1-3]. Humans become infected accidentally by ingesting eggs derived from the feces of infected dogs. The adult worm of *E. granulosus* lives in the jejunum and duodenum of dogs and other canine carnivores (coyote, wolf, fox, jackal, etc.). The larval stage (hydatid cyst) is found in humans and herbivorous animals (typical intermediate hosts are sheep, goats, cattle, horses, and wild ungulates) [4,5].

CE is a re-emerging disease in the former Soviet Republics of central Asia. There has also been a parallel increase in cystic echinococcosis in farm livestock and increases in the prevalence of infections in the dog population [6]. Agricultural land in central Asia is semi-arid mountain pasture, with a predominance of pasture-based livestock production, which provides good conditions for the transmission of *Echinococcus* species in the livestock reservoir. Since the collapse of the Soviet Union in 1991, CE in central Asia has emerged as a major zoonosis with substantial increases in the incidence in humans, caused, according to Torgerson et al. [7], by the privatization of large collective farms, the abandonment of centralized slaughtering and meat processing facilities, and few resources available for veterinary services. Uzbekistan has long been considered endemic for *E. granulosus* in pigs, sheep, and cattle; however, there is little data on the prevalence of *Echinococcus* infections

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in the country. The prevalence of CE in sheep in Uzbekistan increased from 45% to 62% between 1990 and 2002 [8]. In Uzbekistan, a few studies have investigated the risk factors for *E. granulosus* infection in intermediate and definitive animal hosts [6,8]. We herein aim to ascertain prevalence of *E. granulosus* and other helminthes infection in dogs, fox and jackal in the Samarkand region.

We conducted collaborative projects to control echinococcosis in the Samarkand Region of Uzbekistan (2014-2018) under the title of "Capacity Building of Infectious and Parasitic Diseases Control in the Republic of Uzbekistan", supported by the Korean International Cooperation Agency (KOICA). Fecal samples were collected from dogs or hunted animals in Komchik, Chaparashli, O'rta Saydov, and Nurobod of the Samarkand Region (Fig. 1). We examined a total of 1,761 dogs and wild animals (1,749 domestic dogs [*Canis lupus familiaris*]: 582 from Komchik, 507 from O'rta Saydov, 463 from Chaparashli, and 197 from Nurobod); 5 stray dogs, 4 from Komchik, 2 from Chaparashli; 5 Corsac foxes (*Vulpes corsac*), 2 from Chaparashli and 3 from O'rta Saydov; and one golden jackal (*Canis aureus*) from O'rta Saydov for *Echinococccus granulosus* infections. These samples were transferred to the laboratories of the Isaev Research Institute of Medical Parasitology in Samarkand for examination. We used formalin-ether sedimentation and direct fecal smears to detect the presence of helminth eggs. Stray dogs and wild animals were caught and dissected for the investigation of parasite infections. To protect the individuals involved in the necropsy, the procedures were performed according to the 1981 FAO/UNEP/WHO Guidelines [9]. Following the transfer of animals to the lab, their small intestines were removed, opened, and examined in a dissecting pan containing water. The mucosa was scraped with a scalpel. We examined mucosal scrapings and intestinal contents under a stereomicroscope. We used soil surveys around houses of residents with probable *Echinococcus* cysts (9 people from Chaparashli and 5 people from O'rta Saydov). We collected soil samples from 10 sites around each house using a soil sampler and examined the soil for helminth eggs. The sediment from each site was equally divided and examined by floatation with a saturated salt solution [10] and Petri dish plates for helminth eggs. The sediment in the Petri dishes was diluted in saline and examined under a stereomicroscope to look for the presence of helminth eggs.

Fig. 1. Survey region in the Samarkand (1, Komchik; 2, O'rta Saydov; 3, Chaparashli; 4, Nurobod).

A total of 1,761 dogs and wild animals were examined. We found 658 adult worms of *Echinococcus granulosus* in house and stray dogs (Collection rate: 1.60% [28/1,755]) and a golden jackal (100% [1/1]) (Table 1). However, we found no *E. granulosus* adult worms in the Corsac foxes (0% [0/5]). Stray dogs showed high infection rates (66.7% [4/6]: 50% [1/2] from Chaparashli and 75% [3/4] from Komchik). However, infection rate in domestic dogs (1.37% [24/1,749]; 0.43% [2/463] from Chaparashli, 0.86% [5/582] from Komchik, 7.11% [14/197] from Nurobod and 0.59% [3/507] from O'rta Saydov) was lower at 3 collection sites (Chaparashli, Komchik, and O'rta Saydov), but not in the Nurobod site. It is assumed

Table 1. Infection status of domestic and wild animals collected in the Samarkand region from 2015 to 2018

Animals/no. of animal examined	Parasites	Collection sites
House dogs/1,749	*Echinococcus granulosus* *Toxocara canis* *Trichocephalus vulpis*	Chaparashli, Komchik, Nurobod, O'rta Saydov
Stray dogs/6	*Echinococcus granulosus* *Dipylidium caninum* *Diplopylidium nolleri* *Mesocestoides lineatus* *Taenia hydatigena* *Toxocara canis* *Trichocephalus vulpis*	Chaparashli, Komchik
Golden jackal/1	*Echinococcus granulosus* *Diplopylidium nolleri* *Mesocestoides lineatus*	Komchik
Corsac foxes/5	*Alaria alata* (Diplostomatidae) *Dipylidium caninum* *Taenia hydatigena* *Toxascaris leonina* *Uncinaria stenocephala* *Mesocestoides lineatus*	Chaparashli, O'rta Saydov

that the low echinococcosis infection rate in domestic dogs from the 3 collection sites has resulted from a regulation requiring veterinarians to administer anti-helminthic drugs every 3 months to dogs. Aminjanov and Aminjanov (2004) have been studied a total of 240 village dogs and 279 farm dogs in Uzbekistan [8]. Of these, 56 farm dogs (20.1%) and 19 village dogs (7.9%) were infected. The farm dogs were significantly more infected than the village dogs. There are an estimated 1.5 million dogs in Uzbekistan, and 75% of the households own dogs. That is, there is one dog for every 15 persons. That many dogs might represent a considerable biomass of parasites and pose a high risk for human infections [11]. In this study, the jackal was first identified as a definitive host for *E. granulosus* in Uzbekistan. Therefore, new control strategies to prevent the transmission of *E. granulosus* to sheep are needed. Dogs either live with herds of sheep or look after the house or farm. Meanwhile, stray dogs roam freely and live on food garbage. In addition to stray dogs, other carnivores, such as jackals and foxes, particularly in mountainous areas, may enter human houses and farms in search of food. These carnivores may consume the infected organs of slaughtered animals, which sometimes are left behind around private abattoirs in small villages [12]. We also collected helminth parasites from the intestines of house and stray dogs, corsac foxes, and a golden jackal. A total of 749 parasites were collected from 28 house dogs and stray dogs, including 7 parasites (Collection rate: 7.14% [2/28]) *Taenia hydatigena*, 124 (57.14% [16/28]) *Dipylidium caninum*, 3 (7.14% [2/28]) *Diplopylidium nolleri*, 10 (10.71% [2/28]) *Mesocestoides lineatus*, 500 (100% [28/28]) *Echinococcus granulosus*, 54 (28.57% [8/28]) *Toxocara canis*, and 51 (39.29% [11/28]) *Trichocephalus vulpis*. We collected 48 parasites from 5 Corsac foxes, including 3 (20.00% [1/5]) *Taenia hydatigena*, 4 (40.00% [2/5]) *Toxascaris leonina*, 24 (60.00% [3/5]) *Alaria alata*, 5 (20.00% [1/5]) *Uncinaria stenocephala*, 5 (40.00% [2/5]) *Dipylidium caninum*, and 4 (40.00% [2/5]) *Mesocestoides lineatus*. We collected 163 parasites from 1 golden jackal, including 2 *Diplopylidium nolleri*, 3 *Mesocestoides lineatus*, and 158 *E. granulosus* (Table 2). Humans are infected by the ingestion of *E. granulosus* eggs in contaminated food, water, and soil, or through direct contact with animal hosts. The soil surveys around houses of residents with probable *Echinococcus* cysts done by ultrasonographic investigation found taeniid eggs at 2 houses. Of the 15 households surveyed, only 1 house had no dogs. The eggs of other tapeworm species identified in dogs were *Toxocara canis*, *Dipylidium caninum*, and *Taenia hydatigena*. *Echinococcus granulosus* eggs are morphologically indistinguishable from those of other taeniid cestode, and the release of eggs is variable and inconsistent. PCR techniques have been reported to be useful where the presence of the parasite in the dog population is relatively low, as well as for discriminating *Echinococcus* from other taeniid infections in dogs [13-15].

Wild carnivores, including jackals, wolves, and probably foxes, have been found to be infected with Echinococcosis adult worms, demonstrating the co-existence of a domestic and sylvatic cycle [12,16-18]. In Uzbekistan, the distribution of reservoir hosts is important for understanding the epidemiology of echinococcosis, as well as the potential impact on human health. Physical contact with stray dogs or accidental contact with wild canid feces is risk factors for echinococcosis. Periodic mass treatment of dogs with anti-helmintics, such as praziquantel or albendazole, the prohibition of giving raw infected viscera to dogs, and adequate inspection of abattoirs, as well as educational measures to change human practices that facilitate hydatid disease transmission, have been reported to be effective in the control of echinococcosis [19-21]. This investigation of *E. granulosus* infections in stray dogs and golden jackals confirmed them to be potential reservoir hosts for human infections in the Samarkand Region. The results suggest that a control program for reservoir hosts is also necessary to prevent echinococcosis in humans and livestock in Uzbekistan.

Table 2. Helminth parasites isolated from the intestine of dogs and wild animals Captured in the Samarkand region from 2015 to 2018

Animals	Parasites									
	Taenia hydatigena	*Toxascaris leonina*	*Alaria alata*	*Uncinaria stenocephala*	*Dipylidium caninum*	*Diplopylidium nolleri*	*Mesocestoides lineatus*	*Echinococcu granulosus*	*Toxocara canis*	*Trichocephalus vulpis*
House dogs	0	0	0	0	0	0	0	200	12	21
Stray dogs	7	0	0	0	124	3	10	300	42	30
Golden jackal	0	0	0	0	0	2	3	158	0	0
Corsac foxes	3	4	24	5	6	0	4	0	0	0

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CONFLICT OF INTEREST

The authors declare no conflict of interest related to this study.

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