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Intestinal Protozoa in Wild Boars (*Sus scrofa*) in Western Iran

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ABSTRACT: A total of 12 gastrointestinal tracts of wild boars (*Sus scrofa*) from western Iran (Luristan) were examined for protozoan infection between September 2000 and November 2001. Of 12 boars examined, 67% harbored one or more species of the following protozoa: *Balantidium coli* (25%), *Tritrichomonas suis* (25%), *Blastocystis* sp. (25%), *Entamoeba polecki* (17%), *Entamoeba suis* (8%), *Iodamoeba butschlii* (17%), and *Chilomastix mesnili* (8%). Four of these protozoan species also are reported in humans, and persons living in rural areas where wild boars are abundant should take precaution to avoid infection.

Key words: Intestinal protozoa, Luristan, public health, survey, *Sus scrofa,* wild boar.

Wild boars (*Sus scrofa*) are widely distributed over Europe, Asia, northern Africa, and other parts of the world (Macdonald, 2001). In Iran, wild boars are found throughout the country. They are shot by farmers because of the damage they cause to crops and are hunted by ethnic Armenian Christian minorities for their meat. Because of their association with farmland, there is a possibility of contact, and thus shared infections, among wild boars, livestock, and humans. Despite this potential for shared infections, there are no reports of the intestinal protozoa of wild boars in Iran or any information on transmission of infection from boars to domestic animals and humans. Therefore, we examined intestinal protozoa of wild boars in Luristan (western Iran) and consider the role that this animal may play in the epidemiology of human intestinal protozoa.

Twelve wild boars (seven females and five males) from nine regions of Luristan (32°–34°N, 46°–50°E; Table 1) were shot from September 2000 to November 2001 under license from the Iranian Environmental Protection Organization. Their age (according to dental formula and physical appearance), sex, and locality were recorded. The entire gastrointestinal tract was removed and opened longitudinally. The content of each tract was collected, and stored in labeled, wide-mouthed vials with tightly fitting lids. A smear of feces in 0.9% saline was prepared and the formol-ether concentration method (Ritchie, 1948) was applied to each sample for detection of trophozoites and cysts of parasitic protozoa.

Fresh feces were cultured in horse serum diphasic media (HSre+S) (Diamond, 1983) within 2 hr of collection. After 72 hr, a drop of culture sediment was examined microscopically for the presence of protozoal trophozoites. Protozoa were identified according to keys of protozoa (Soulsby, 1982). Representative specimens are filed at the Protozological Museum, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.

A total of seven protozoan species were found in 12 wild boars examined. Eight boars (67%) were infected by at least one species. Multiple infections were more frequent than single ones, and infections with one, two, and three species were found in two (17%), two (17%), and five (42%) boars, respectively. *Balantidium coli, Tritrichomonas suis,* and *Blastocystis* sp. were the most common protozoa observed. *Balantidium coli* trophozoites averaged 91×54.4 μm, indicating that were the large race of this species. Other protozoa observed were *Entamoeba polecki* (17%), *Iodamoeba butschlii* (17%), and *Chilomastix mesnili* (8%) (Table 2). The pyriform cysts of *C. mesnili* were 6×8 μm.

Rate of infection tended to be higher in older animals compared to younger ones and higher in females than in males (Table 2). Adult females and young generally

TABLE 1. Age and sex of wild boars studied from western Iran.

Sex	Host age (yr)	Locality
Female	1.0	Boroujerd
	1.5	Khorramabad
	2.0	Khorramabad
	3.0	Aligoodarz
	3.0	Dorood
	4.0	Azna
	4.5	Koohdasht
Male	2.0	Noorabad
	2.0	Aleshtar
	2.0	Poledokhtar
	3.0	Khorramabad
	4.0	Aligoodarz

form a herd, whereas adult males live separately and only join herds during the mating season. The herding behavior of the females and young, with increased social contact, may explain why the females have higher rate of infection than males.

This study and the report of Sheiban (1971) found that *B. coli* was the most common protozoa found in Iranian suids, suggesting that boars could play a role in the epidemiology of human balantidiasis in Iran, presumably in rural areas. We also believe that human-to-human transmission is responsible in part for human balantidiasis in Iran.

Balantidium coli has worldwide distribution among domestic and feral pigs and according to Schwartz and Clarkson (1999), endemic foci of this infection include Central and South America, the Philippines, New Guinea, Iran, Southeast Asia, and certain Pacific Islands. Nakauchi (1999) studied prevalence of *B. coli* in 56 mammalian species and found that 100% of wild boars were infected. Rezaian (unpubl. data) found that infection of wild boars is high (about 70%) in the northern part of Iran. Sheiban (1971) reported *B. coli* from domestic pigs of piggeries around Tehran.

Among Muslims, because their religious beliefs prohibit consumption of pork, infection by *B. coli* may be due to direct human-to-human transmission (Geddes, 1952). However, Sanati et al. (1972) reported that human balantidiasis in urban areas is so low (2 of 20,694) that human-to-human transmission may be negligible. Jalayer et al. (1988) reported two cases of human infection from Bandare-Jask in littoral regions of the Persian Gulf, suggesting that wild boars may be involved in transmission of the disease to humans. Because all human cases reported from Iran have been from rural areas, where exposure to feces of wild boars is not uncommon, and because of the absence of domestic pigs in Iran, we believe that wild boars may play an important role in transmitting the disease to humans.

Entamoeba polecki is a cosmopolitan intestinal parasite of pigs, wild boars, and monkeys and may infect humans accidentally. Gay et al. (1985) reported the presence of *E. polecki* for the first time from a group of eight refugees from Southeast Asia. There are contradicting reports about the validity of this species. Levine

TABLE 2. Intestinal protozoa identified in wild boars from western Iran.[a]

	Total (n=12)	Females (n=7)	Males (n=5)
Balantidium coli	3[a]	1	2
Tritrichomonas suis	3	3	0
Blastocystis sp.	3	2	1
Entamoeba polecki	2	2	0
Iodamoeba butschlii	2	2	0
Entamoeba suis	1	1	0
Chilomastix mesnili	1	0	1

[a] Values are number of infected animals.

(1985) reported that this species is a nomen nudum. Verweij et al. (2001) studied the genetic variation of *Entamoeba* in humans and proposed that the agent of human infections with uninucleated cyst-producing *Entamoeba* species was "*E. poleckilike.*" This parasite is not pathogenic in humans or wild boars.

Entamoeba suis is not pathogenic in animals. Our finding of this parasite is the first record in wild boars. *Iodamoeba butschelii,* a nonpathogenic parasite, occurs in the lower digestive tract of pigs, wild boars, and humans, as well a variety of monkeys and baboons (Soulsby, 1982). *Chilomastix mesnili* is a nonpathogenic flagellate of humans. According to Levine (1985), this flagellate also is common in pigs. We found this parasite in only one wild boar. *Tritrichomonas suis* is regarded as nonpathogenic in wild boars and does not appear to infect humans.

Blastocystis sp. in wild boars was morphologically similar to the classic forms of *B. hominis* infecting humans. Thathaisong et al. (2003) reported that *Blastocystis* isolates from a pig and a horse were monophyletic and closely related to *B. hominis* and suggested the possibility of zoonotic potential of *Blastocystis.*

To conclude, the results of this survey indicate that wild boars could be involved in the epidemiology of several protozoan zoonoses by acting as reservoir hosts for parasites that could survive in sylvatic cycles independent of the domestic cycles. Because of the zoonotic potential for a few of these parasites, persons living in rural areas where wild boars are abundant should take precaution to avoid infection.

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