

The gastro-intestinal parasites community of the Przewalski's horse, *Equus przewalskii* Poljakov, 1881, and the domestic horse in the Chernobyl exclusion zone

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ABSTRACT. A diagnostic deworming of 21 Przewalski horses, free-living in the Chernobyl exclusion zone Ukraine, and of six stabled domestic horses, has been conducted eighteen years after the Chernobyl nuclear disaster. This survey yielded 31 species (of 5 families and 3 classes, 28 species of nematodes, 1 species of cestodes, and 2 larvae of botflies). A total 29 and 19 helmith species has been recorded in the Przewalski horse and domestic horse respectively. Only six helmith species were common for the two horse species. Species from the family Strongylidae constituted the dominant helmith group. Four cyathostomine species (*Cyathostomum catinatum*, *Cylicostephanus minutes*, *C. longibursatus*, *Cylicocyclus nassatus*) formed the majority of helmith parasites both in the Przewalski and domestic horses. The presently reported study revealed that Przewalski's horses keep their typical biological features and high resistance to parasitic infections. A substantial growth of heard was observed as well as good clinical health state of horses. This can be an argument favouring the use of Przewalski horses in re-naturalization of ecological disaster areas.

Key words: Chernobyl exclusion zone, gastro-intestinal parasites, Przewalski's horse, *Equus przewalskii*.

Objectives

After the Chernobyl nuclear disaster in 1986 an exclusion zone has been established for the re-naturalization of the polluted area around the decommissioned nuclear plant. After 1986 abandoned farmlands in this zone were declared so-called long-fallow areas. Each year these long-fallow lands produce enormous biomass of grass which is only partly consumed by large herbivores. Horse grazing in this area has been proposed as a remedy of this ecological problem („Fauna" Programme 1998). Horses are the most efficient grass consumers among large herbivore mammals [1, 2]. Therefore, 21 Przewalski horses, *Equus przewalskii*, from the Askania Nova Biosphere Reserve, South Ukraine, have been introduced in the Chernobyl exclusion zone (CEZ) in 1998. The Przewalski horse is included in the IUCN Red Data Book as an endangered species [3]. Parasitic fauna may play an important role in the survival of this species. It is, therefore, especially important to investigate parasite diversity, and extension and intensity of parasite infection in free-living animals. To date, little is known about the helminth fauna of Przewalski horses. This fauna has only been investigated in Przewalski horses living under Zoo conditions in Prague [4] and in Askania Nova [5, 6], but nothing is known about helminth parasites of Przewalski horses living under natural conditions. In this study, we conducted a comparative surveyed helmith faunas of Przewalski horses living under natural conditions and domestic horse living in the same area and in the same time. In 2004, there were 64 Przewalski horses in three breeding groups. These animals have not been subjected to any anti-helminthic treatment to date. In the same area, 19 domestic horses were also kept by some peasants.

Material and methods

In February 2004, the largest of the three reproductive groups of the Przewalski horse was selected for the helminth survey. The group consisted of one

16-year-old stallion, nine 6-12-year-old mares, and eleven 1-2-year-old colts. In March 2004, six domestic horses (two 9-10-year-old stallions, four 4-10-year-old mares) were randomly selected (out of the group pf 19) for the helmithological survey. In addition, a post-mortem survey was performed on a 9-year-old Przewalski horse stallion kept in a Zoo, and on 3-year-old domestic horse stallion from the CEZ. The partial helminthological necropsy followed the methodology of Kotelnikov [7].

The horsed were dewormed using „Univerm" (0.2% aversektin C, produced by FarmBioMed, Moscow, Russia) in a dose 50 mg of Univerm per 1 kg of b.w. From day 2 through 7 post-treatment, all faeces available were collected and preserved in 40% alcohol. In the laboratory, helminths were recovered from the faeces, fixed in 70% alcohol, counted and identified to the species level, using the keys of Dvojnos and Kharchenko [5] and Lichtenfels [8].

All Przewalski horses surveyed were individually recognised in the field. Faeces were collected from each individual separately. Faeces from eight Przewalski horses (stallion and seven mares) were collected on a daily basis, while from the remaining 13 animals, faeces were only collected once during the five-day-survey. A total of 4729 helmith specimens was isolated and all were identified to the species level.

Faeces from domestic horses were collected on a daily basis within the five-day-survey. A total of 5000 helmith specimens were isolated, but only 20% of them (900 specimens) randomly selected, were identified to the species level.

Results

Helmiths were recorded in all 21 Przewalski horses surveyed. The helmith fauna consisted of 29 species represented by three nematode (Strongylidae, Oxyuridae, and Ascaridae) and one cestode fa-

Table 1. Results of parasite survey in 21 Przewalski horses (*Equus przewalskii*) in the Chernobyl exclusion zone

Species	Prevalence (%)	Mean intensity			
		min	Max	mean	SE
Gasterophilus intestinalis	47.6	1	7	2.7	0.3
G. veterinus	9.5	1	1	1	0.1
Anoplocephala perfoliata	14.3	1	2	1.7	0.1
Parascaris equorum	19.0	1	2	1.3	0.1
Oxyuris equi	81.0	1	30	11.4	1.7
S. edentatus	14.3	1	3	2	0.2
S. vulgaris	33.3	2	8	5	0.5
Triodontophorus serratus	19.0	1	2	1.5	0.2
T. brevicauda	4.8	1	1	1	0.1
T. tenuicollis	33.3	1	2	1.3	0.1
Craterostomum acuticaudatum	43.0	1	8	3.3	0.4
Cyathostomum catinatum	95.2	8	125	82.2	6
Coronocyclus coronatus	81.0	1	16	5.1	0.9
C. labiatus	33.3	1	8	3	0.4
C. labratus	33.3	1	3	1.7	0.2
Cylicostephanus calicatus	90.5	1	13	4.4	0.6
C. minutus	100	1	114	38	6.2
C. longibursatus	100	1	81	15.8	3.8
C. goldi	76.2	1	13	4	0.7
C. bidentatus	90.5	1	42	11.5	2.4
Cylicocyclus insigne	42.9	1	19	7.8	1.1
C. leptostomus	71.4	1	22	3.5	1.7
C. nassatus	95.2	5	125	32.7	5.7
C. ashworthi	90.5	1	40	11.5	2.7
C. ultrajectinus	28.6	3	11	7	0.7
Petrovinema poculatum	9.5	1	1	1	0.1
Cylicodontophorus bicoronatus	23.8	1	6	2.2	0.2
Parapoteriostomum euproctus	47.6	1	8	3.6	0.5
P. mettami	14.3	1	3	1.7	0.1
Poteriostomum ratzii	9.5	1	1	1	0.1
Gyalocephalus capitatus	33.3	1	4	2.3	0.2

mily (Anoplocephalidae). The nematode of the family Strongylidae was represented by 26 species belonging to the subfamily Strongylinae (six species) and Cyathostominae (20 species). The prevalence of the strongylid infection was 100%. *Cylicostephanus minutus*, *C. longibursatus*, *C. bidentatus*, *Cyathostomum catinatum*, *Cylicocyclus nassatus*, *C. calicatus*, and *C. asworthi*, occurred in more than 90% of Przewalski horses surveyed. *Coronocyclus coronatus*, *Cylicostephanus goldi*, and *Cylicocyclus leptostomus* occurred in 70-81%, and the remaining 17 species were found in fewer than 50% of all Przewalski horses surveyed (Table 1). *Oxyuris equi* of the family Oxyuridae was recorded in 81%, while *Parascaris equorum* of the family Ascaridae in 19% of Przewalski horses surveyed.

In general the intensity of nematode infection was low. The mean number of specimens of a given species from the subfamily Strongylinae ranged from 1.0 to 3.3, while that from the subfamily Cyathostominae ranged from 1.0 to 88.2. The mean number of oxyurid specimes per horse was 11.4, while that of ascarid specimens 1.3. *Cyathostomum catinatum* was by far the most abundant nematode species. The mean number of specimens of *Cylicostephanus minutus* and *Cylicocyclus nassatus* per horse was 38 and 33, respectively. The mean number of specimens of the remaining 22 strongylid species was less than 15 (Table 1).

Other helmith families were represented by single species only. Tapeworms were only recorded in 14.3% of Przewalski horses surveyed. The number of tapeworms per horse ranged from 1 to 2 (mean 1.6).

Two non-helminth gastro-intestinal parasites, *Gasterophilus intestinalis* and *G. veterinus* (Diptera: Gasterophilidae) were also recorded. The prevalence of *G. intestinalis* was 47.6%, while *G. veterinus* amounted to 9.5%. The number of *G. intestinalis* specimens per horse ranged from 1 to 7 (mean 2.7), while only single specimens of *G. veterinus* were recorded in each horse species.

In the Przewalski horse kept in a Zoo, 15 nematode species were recorded. All belonged to the family Strongylidae. The most abundant species were *Cyathostomum catinatum*, *Cylicostephanus longibursatus* and *Cylicocyclus nassatus*. They formed together 69.6% of all nematode species recorded.

Helminths were recorded in all six domestic horses surveyed. The helminth fauna was represented by 18 species, all from the family Strongylidae. The subfamily Strongylinae included *Strongylus edentatus* and *Triodontophorus serratus*. These species were recorded in single horses and were represented by a few specimens only (Table 2). The subfamily Cyathostominae included 16 species. Six of these species, namely *Cyathostomum catinatum*, *Cylicostephanus minutus*, *C. longibursatus*, *C. calicatus*, *Cylicocyclus nassatus*, and *C. ashworthi* were recorded in all horses surveyed. Six other nematode species were recorded in 33-67% of horses, while four remaining species in single horses only. Nematode

Table 2. Results of helminth survey in 6 domestic horses (*Equus caballus*) in the Chernobyl exclusion zone

Species	Prevalence (%)	Mean intensity			
		min	Max	mean	SE
Strongylus edentatus	16.6	3	3	3	0.5
Triodontophorus serratus	16.6	4	4	4	0.66
Cyathostomum catinatum	100	18	76	36	8.55
Coronocyclus coronatus	66.6	1	4	2	0.61
C. labiatus	33.3	1	2	1.5	0.34
Cylicostephanus calicatus	100	3	7	0.2	1.11
C. minutus	100	2	46	28.2	8.15
C. longibursatus	100	8	54	23.2	7.95
C. goldi	50	2	12	6	1.91
C. bidentatus	16.6	1	1	1	0.16
Cylicocyclus insigne	33.3	1	1	1	0.21
C. leptostomus	66.6	3	41	14.3	6.41
C. nassatus	100	5	46	26.2	6.42
C. ashworthi	100	3	57	14.3	8.57
C. ultrajectinus	16.6	5	5	5	0.83
Parapoteriostomum mettami	16.6	1	1	1	0.16
Poteriostomum ratzii	16.6	1	1	1	0.16
Gyalocephalus capitatus	50	1	2	1.3	0.33

species with the highest prevalence of infection (100%) had also the highest intensity (the number of specimens per horse), except for *Cylicostephanus calicatus*. The most abundant nematode species was *Cyathostomum catinatum*. The number of specimens of this species per horse ranged from 18 to 76 (mean 36). As to four other nematode species, the mean number of specimens per horse ranged from 14.3 to 28.2.

In the dissected domestic horse, 19 helminth species (18 from the family Strongylidae and one from the family Oxyuridae) were recorded; *Cylicocyclus elongatus*, *C. nassatus* and *Cylicostephanus minutus* comprised 84.0% of all nematode species recorded. A single specimen of *Gasterophilus intestinalis* (Diptera: Gasterophilidae) was also recorded.

Conclusions

A total of 31 parasites species were recorded in both horse species surveyed in the CEZ. A total of 31 parasites species were recorded in the free-living Przewalski horses, while only 15 such species were recorded in a Przewalski horse living under Zoo conditions. In the domestic horses and in stabled horses, 19 and 18 helmith species were recorded, respectively. It appears therefore, that the higher helminth diversity in both horse species surveyed prevails in herds than in stabled horses. On the other hand, the intensity of helminth infection appears to be higher in the stabled than in the free-living horses. Observations show that horses keep their typical biological features and high resistance to parasitic infections. A substantial growth of heard was observed as well as good clinical health state of horses. This can be an argument favouring the use of Przewalski horses in re-naturalization of ecological disaster areas.

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