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Studies of parasitic horse diseases in the Republic of Belarus.

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ABSTRACT

Despite growing technological advances, there is a worldwide interest in horses. Horses have an important role in human health and the development of horse sport. Horses produce several biologically important materials that are used in the biotechnological and pharmaceutical industries. Horses are very sensitive to various diseases. The digestive tract of horses is especially prone to infection by various pathological agents. In this study, we aimed to analyze helminth infection in the digestive tract of horses. We were first, who studied the fauna and specific structure of intestinal helminths in Belarusian horses. We collected more than 20,000 helminths from the large intestines of 107 horses were killed on the state meat factory Our surveyed animals belonged to different age groups: foal (i.e., 3 months to 1 year; n = 53), young (i.e., 1–3 years; n = 20), and adult (i.e., >3 years; n = 34). Our study identified helminth parasitic infection in different parts of the gastrointestinal tract in horses. The prevalence of gastrointestinal infestation by helminths in horses 1 year old was significantly lower than in those in other age groups. With increasing age of the horse, the quantity of helminth infection increased and peaked in horses older than 15 years (Trichonematidae, 4000 eggs under 20× magnification; and Strongylidae, 340 eggs under 20× magnification). The helminthofauna tract of horses in Belarus was represented by 30 species of nematodes, which included 26 strongyles and Cyathostomatidae. The dominant nematodes of the family Strongylidae were *Strongylusequinus, Delafondia vulgaris, Alfortiaedentatus, Triodontophorus serratus*, and *Triodontophorusbrevicauda.* From the family Trichonematidae, the species were *Cyathostomumtetrakanthum, Cylicocyclusnassatus, Cylicostephanuslongibursatus, Cylicostephanusgoldi, Cyathostomumpateratum, Cylicocyclus insigne, Cylicostephanusminutus* and *Coronocycluslabiatus*.

Keywords: avermectin paste 1%, Equisect paste, horse, nematode, rivertin, univerm

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INTRODUCTION

There is a worldwide interest in horses, despite developments in technology. Horses have an important role in human health and the development of horse sport, using in kids treatment with cerebral palsy. Evidence from the past 10 years shows that horses produce several biologically materials that are important in the biotechnological and pharmaceutical industry [1].

Horses have specific anatomy and physiological features make them sensitive to various diseases. The digestive tract of horses is especially prone to infection by various pathological agents. Helminths (e.g., strongylata, ascaridata, strongyloidosis, oxyurosis, anoplocephalidosis) are the most common causes of infections of the digestive tract of horses [2]. A helminthic invasion in horses decreases the serviceability, endurance, and immune system of animals[3]. Long-lived infestation, helminthes decreases the exterior and phenotype qualities of horses. In this regard, prophylaxis and the elimination of helminthiases are integral for efficient horse breeding.

Numerous research studies are being conducted worldwide treat helminthiases of horses with treatments that are efficient, cheap, pollution-free, harmless to the animals, and convenient to use [4]. However, so far, it has been difficult to find highly effective treatments. Thus, it is necessary to continue searching for new potential medicines that would possess broadspectrum activity and would satisfy the high production requirements. The pharmacological effect of medicines and the ghost effect from their application depend on their chemical constitution, doses, concentration, frequency of administration, and method of introduction into horses. Many researchers point to the negative impact of anthelmintics:the inconvenience of application, a low chemotherapeutic index, embryotoxic properties, and localized action.

In the Republic of Belarus, horse breeding is affected by several natural and economic factors. In recent years, because of the Energy Crisis, interest and attention in horses has increased. Horse breeding contributes to the national economy, sports, and export [5]. Successful breeding requires well-timed diagnostic studies, and preventing and treating diseases, including parasitic diseases [6-8]. The parasitic infection in horses is widespread in the Republic of Belarus. A major problem is that most parasitocenosis proceeds asymptomatically, and causes extensive economic damage. According to the Department of Parasitology and Invasive Diseases of Animals at the Vitebsk State Academy (Vitebsk, Belarus), in numerous farms of Belarus, strongylata and gadfly paraskariosis infect 60%–100% of horses, oxyurosis infects 45% of horses, anoplocephalidosis infects 40% of horses, and strongyloidosis infects 20% of horses; coccidia infection has also been detected [9].

MATERIALS AND METHODS

In this study, we collected more than 20,000 helminths from the large intestine of 107 horses were killed on the state meat factory. All helminths in the digestive tract were selected and identified using Barbagallo's solution. G. M. Dvoynos and T. I. Popova's continuants were used to identify the precursors of helminths [10,11]. The number of female and male nematodes of dominant species was counted by automatic counter of theformed elements of blood. Measurements were conducted with an eyepiece micrometer. The number of petals of the external radial crown and internal radial crown were counted on apical cuts.

The researched animals were divided into three age groups: foals (i.e., 3 months to 1 year old; n = 53), young (i.e., 1–3 years old; n = 20), and adults (i.e., >3 years old; n = 34).

For the purpose of studying the distribution of intestinal helminthiases of horses, stool samples were investigated by the Darling's floatation method with a saturated solution of sodium chloride. Excrement samples were collected by inserting two fingers into the rectums; the weight of the samples ranged from 10 to 15 g. Each stool sample was wrapped in a separate paper bag, on which the nickname and the age of the corresponding horse were written. The number of helminthseggs was calculated under a microscope (20× magnification) to determine the quantity of an invasion. Some eggs were selected for identification of intestinal strongylata, we cultivated larvalstage by using Velichkin's method: the temperature was maintained at 25°C–27°C and the relative humidity at70°–75% for 7 days.

The efficiency of the anthelmintic medications were checked by the fecal culture researchers on 14, 21, and 30 days after their application. The number of helminth eggs was calculated under 20×magnification. We investigated the influence of the medicines on the clinical condition of the horses.

After deworming, within 3 days, intestinal helminthes were extracted from the excrement samples and their genuses were defined. The excrement samples were investigated by the levigation method. All helminths in the excrement samples were selected, recorded in Barbagallo's solution, and further identified. Methodic ofG. M. Dvoynos and T. I. Popova's were used to identify larval forms of helminths [12,13].

To assess the comparative effectiveness of the anthelmintic medications, a series of processing of horses performed, which were infested spontaneously by intestinal helminthiases. Univerm was applied at a dose of 0.1 mg/kg to intestinal nematodes at a 1-day interval. Rivertin (1%) was administered and mixed with the forage (i.e., dry or humidified) in the morning feeding at the dose of 20 mg/kg of live weight (0.2 mg/kg on active substance[AS])against of internal parasites/insects (e.g., gasterophylesis and rhynestrosis) at the dose of 10 mg/kg of mass of an animal (0.1 mg/kg on AS) for 2consecutive days.

Avermectin(1%) paste was applied to individual horses orally in a single-passata dose of 2 g/100 kg of live weight (0.2 mg/kg on AS) for treating strongylatosis, strongyloidosis, trichonematidoses, paraskariosis, and oxyurosis. During the pasturable period, strongylatosis (e.g., trichonematidosis, strongylidosis) was processed once in 2 months. Neonatal foals were processed from the age of 3months before of the age of 6 month, once in 2 months. For a strongyloidosis invasion, the neonatal foals were processed once monthly from the age of 2weeks. Againstparaskariosis and oxyurosis, in the winter period, horses required processing once every 2 months, and required processing monthly in neonatal foals 2–3months old. Ivermectin (1%) was injected in the animals subcutaneously single-passlyat the dose of 1 mL/50 kg of live body weight (0.2 mg of the active ingredient [AI] on 1 kg of live weight). For treating itches, a drug for sifunculatoses was repeatedly injected in horses at an interval of 7–10 days. Pharmatsin (Aversekt-2) ("PharmBioMed", Moscow), 1% sterile injection medication, was injected in an animal subcutaneously single-passlyat the dose of 1 mL/50 kg of live body weight (0.2 mg of the AI on 1 kg of live weight). For treating horses with itches, the medication was injected in horses repeatedly at an interval of 7–10 days. Dectomax was injected subcutaneously or intramuscularly single-passlyat the dose of 1 mL/50 kg of live body weight. Ivermek was used at the dose of 1 mL/50 kg of live body weight single-passly intramuscularly or subcutaneously. Albendatim-100 and albendatim-200 (containing 10% and 20% granulate of albendazole, respectively) was used single-passly: albendatim-100 at 75 mg/kg andalbendatim-200 at 37.5 mg/kg of mass of an animal. The granulate of "20% Albazen of 20%" was used in horses individually or in a group method single-passly together with the forage, without preliminary food restriction, at a dose of 37.5 mg/kg of live weight. Timbendazol (22% a granulate of phenbendazol) was used in a group methods single-passly with the forage without a preliminary starvation diet. Forparaskariosis, strongyloidosis, and strongylatosis of the digestive tract, this medication was used at a dose of 45 mg/kg. Foroxyurosis, dictiocaulesis, and anoplocephalidoses, the dosage was 68 mg/kg of live body weight. Alverm was used orally with forage or water at a dose of 80 mg/kg of live mass of an animal by single-passly group or the individual method, but without preliminary dietary starvation.

The flowers of ordinary tansy (which is in the family Asteraceae) contain flavonoids, essential oils, tanning agents, a bitter taste, alkaloids, and vitamins and high effective against nematodoses. It was used in solution (1:10) to treat parascariosisat a dose of 3 mL/kg of live body weight twice daily. For strongylatosis of the digestive tract, the dose of this herbal medication was 3 mL/kg twice daily for 3consecutive days. The grass of sagebrush bitter (which also is in the family Asteraceae) contains bitter glycosides, an essential oil, flavonoids, volatiles, alkaloids, organic acids, vitamins, tanning agents, and pitches, which were used in solution (1:20) at a dose of 1 mL/kg of live weight, and powder from the grass of sagebrush bitter was administered at a dose of 20 g/100 kg of live body weight once daily for 3consecutive days.

RESULTS

The horse-keeping conditions and a horse's age had a significant effect on the extensiveness and intensity of an invasion by helminths in the thick section of intestine. From 107 examined horses, 99 (92.5%) animals were infested by trichonematida, whereas eight (7.5%) animals were free from helminthes (Table 1).

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Table 1: The effect of age on strongylata infection in the intestinal tract of horses

No.	Helminth species	Age					
		Foals		Young		Adults	
		n = 53		n = 20		n = 34	
		EI%	II	EI%	II	EI%	II
1	*Cyathostomumtetracanthum*	84.9	++++	100	++++	100	++++
2	*Cyathostomumpateratum*	84.9	+++	100	+++	100	+++
3	*Cylicocyclusnassatus*	84.9	++++	100	++++	100	++++
4	*Cylicocyclusinsigne*	45.3	+	85	+	91.2	+
5	*Cylicocyclusultrajectinus*	-	-	80	+	14.7	+
6	*Cylicocyclusleptostomus*	7.5	+	35	+	20.6	+
7	*Cylicocyclusradiatus*	-	-	-	-	5.8	+
8	*Cylicostephanuslongibursatus*	77.4	+++	95	+++	94.1	+++
9	*Cylicostephanusgoldi*	64.1	++	100	+++	91.2	+++
10	*Cylicostephanusminutus*	71.7	+++	85	++	88.2	+/++
11	*Cylicostephanuscalicatus*	15	+/++	55	+/++	53	+/++
12	*Cylicostephanushybridus*	-	-	15	+	20.6	+
13	*Coronocycluslabiatus*	-	-	100	++	100	++
14	*Coronocycluscoronatus*	1.9	+	10	+	5.8	+
15	*Coronocyclussagittatus*	-	-	5	+	-	-
16	*Gyalocephaluscapitatus*	-	-	-	-	5.8	+
17	*Poteriostomumratzii*	-	-	5	+	2.9	+
18	*Cylicodontophorusmettami*	3.8	+	15	+	5.8	+
19	*Cylicodontophorusbicoronatus*	-	-	-	-	2.9	+
20	*Cylicotetrapedonbidentatus*	-	-	10	+	2.9	+
21	*Strongylusequinus*	7.5	+	65	+/++	76.5	+/++
22	*Delafondia vulgaris*	15	+	60	+/++	61.7	+/++
23	*Alfortiaedentatus*	9.4	+	45	+/++	53	+/++
24	*Triodontophorus serratus*	56.6	+/++	55	++	79.4	++
25	*Triodontophorusbrevicauda*						
26	*Craterostomumacuticaudatum*	5.6	+	10	+	17.6	+

Helminthological autopsy at a Vitebsk meat-processing plant.
+ low intensity of invasion; ++ average intensity of invasion; +++ high intensity of invasion; ++++ very high intensity of invasion. EI ,extensity of infestation; II, intensity of infestation.

Cyathostomumtetrakanthum and *Cylicocyclusnassatus*were found in 99 (92.5%) animals, with a large number of occurrence (>100 copies/individual). The intensity of invasion by *Cylicostephanuslongibursatus, Cylicostephanusgoldi* and *Cyathostomumpateratum* exceeded 70 copies: 45 copies for *Cylicostephanusminutus and Coronocycluslabiatus*; 25 copies for *Cylicocyclus insigne*, *Cylicostephanuscalicatus* and *Cylicocyclusultrajectinus; and 15 copies for Cylicocyclusleptostomus, Cylicostephanushybridus, Cylicodontophorusmettami, Coronocycluscoronatus* and *Cylicotetrapedonbidentatus.* A few copies of *Gyalocephaluscapitatus, Poteriostomumratzii, Cylicocyclus radiatus, Cylicodontophorusbicoronatus, Coronocyclussagittatus* were detected.

Foals had the same number of helminth types asadult horses. However, *Cylicostephanushybridus, Cylicocyclusultrajectinus,* and *Coronocycluslabiatus* were not detected. Higher extensiveness of infection of foals were found with trichonematida. In particular, *Cylicostephanuslongibursatus* and *Cylicostephanusminutus*, and lower extensiveness of infection was found with *Cylicocyclus insigne*. Our study registered two *Triodontophorus* nematodes (*Triodontophorusserratus and Triodontophorusbrevicauda*) for horses in horse-breeding farms in the Republic of Belarus.

Among 53 foals, 30 animals were infected with *Triodontophorus*nematodes with an invasion intensity of 6–28 copies/individual. Among 20 horses aged 1-3 years, 11 animals were infected by a *Triodontophorus*

species with an intensity of 11–23 copies/individual. Among 34 adult horses,27 animals were infected with invazirovana of a triodontoforusama with an intensity of 18–31 copies/individuals. These findings established that the common extensiveness of a *Triodontophorus* invasion was 63.5%.

Craterostomumacuticaudatum has also been registeredfor horses in horse-breeding farms in the Republic of Belarus. Among 107 examined animals, 11 horses were infected with *C. acuticaudatum* with an intensity of 1–14 copies/individual. The extensiveness of the infestationof horses by this nematode was 10.3%. Parasitic infection in the thick section of the intestines of horses by *Strongylusequinus, Delafondia vulgaris,* and*Alfortiaedentatus*were found in horses >1 year old.

In this study of the alimentary system of Belarusian horses, we identified the infection by 20 types of nematodes of the Trichonematidae (Cyathostomatidae) family: *Cyathostomumtetracanthum, Cylicocyclusnassatus, Cylicostephanuslongibursatus, Cylicostephanusgoldi, Cyathostomumpateratum, Cylicocyclus insigne, Cylicostephanusminutus, Coronocycluslabiatus, Cylicostephanuscalicatus, Cylicocyclusultrajectinus, Cylicocyclusleptostomus, Cylicostephanushybridus, Cylicodontophorusmettami, Coronocycluscoronatus, Cylicotetrapedonbidentatus, Gyalocephaluscapitatus, Poteriostomumratzii, Cylicocyclus radiatus, Cylicodontophorusbicoronatus, Coronocyclussagittatus*; and sixspecies from theStrongylidae family:*Strongylusequinus, Delafondia vulgaris, Alfortiaedentatus, Triodontophorus serratus,Triodonthophorusbrevicauda,* and*Craterostomumacuticaudatum*. In addition, *Parascarisequorum* from the Ascaridae family, *Oxyurisequi*from the Oxyuridae family, and *Anoplocephalaperfoliata* from the Anoplocephalidae family were also detected.

We revealed the localization of helminths that caused parasitic infection inhorses: all sections of the digestive tract, including the large digestive glands (e.g., liver and pancreas), were infected. This finding was surprising.

Table 2: Distribution of Intestinal Helminths in Horses

Species of helminth	Condition of Detention							
	The private sector (n =55)		Farms containing up to40 animals (n =248)		Farms containing 50–100 animals (n =316)		Stud farm (n =190)	
	EI (%)	II	EI (%)	II	EI,%	II	EI (%)	II
Parascarisequorum	16,0	+	19,7	+++	19,3	+	6,8	++
Oxyurisequi	1,8	++	23,8	+++	16,4	+++	6,6	+
Trichonema spp.	22,2	+	98,8	++++	99,0	++++	94,2	+/++
Strongylus spp.	--	--	35,5	+	37,9	++	34,2	+
Strongyloides westeri	--	--	0,8	+	--	--	--	--

Type of the helminth, grouped by the keeping condition of the horses.
+, low invasion intensity; ++, average invasion intensity; +++, high invasion intensity; ++++ very high invasion intensity; EI, the extensity of infestation; II, the intensity of infestation.

The absolute prevalence of the helminths parasitizing various sections of digestive tract was in horses 1–5years or older. In parasitized horses of the same age groups, the greatest number of helminths types was six species. The intensity of invasion was much lower in horses <1 year old. As the age of horses increased, the intensity of invasion of helminthiases increased and reachedits maximum in horses 15 years or older (Trichonematidae: 4000 eggs, under 20× magnification; Strongylidae: 340 eggs, under 20× microscope).

To assess the comparative effectiveness of the anthelmintic medications, a series of processing of horses was performed. The horses were infested spontaneously by intestinal helminthiases. Good effectiveness was noted by using of medications such as avermectins group and benzimidazoles.

We found that 1% avermectin paste medication led to a reliable increase in the hemoglobin content. After using 1% avermectin, the hemoglobin content in the blood of horses increased by 12.4% and on 7th day

reached the level of 129.0 ± 0.37 g/L (p <0.01), whereas the content in the infested animals was 113.0 ± 0.21 g/L. By 21 days, the hemoglobin content increased further to 130.5 ± 0.30 g/L, which was 10.3% higher than that of the group animals, which used other group of anthelminthic(117 ± 0.12 g/L) (p<0.01). Under the influence of the medication in sick animals, the blood leukocyte level had increased by 13.6% on the third day (p < 0.05), and it increased one more time to 31.6% on the 14th day (p<0.001), compared to the infested animals. In the leukogram, the number of eosinophils significantly changed from 9.4 ± 0.51 before treatment to 4.4 ± 1.17 on the seventh day (p<0.05).

For a better understanding about the effect of medicine on the infective organismsin the horses, we conducted biochemical blood analyses. The conducted research revealed that the main shifts occurred in protein fractions and in their ratios. On the third day after using 1% avermectin paste, the quantity of albumins sharply increased from 19.78 ± 2.79 to 37.46 ± 0.70mmol/L (p<0.001) and γ-globulins increased from 19.92 ± 2.58 to 29.14 ± 1.45mmol/L (p<0.01). By contrast, the α-and β-globulin levels decreased from 20.48 ± 2.68 to 16.74 ± 1.13 and from 39.82 ± 2.79 to 16.66 ± 1 (a 43% decrease) respectively. As a result, the albumin-globulin ratio increased from 0.25 ± 0.05 to 0.60 ± 0.02 on the animals' third day of treatment (p <0.001). By the seventh day, the quantity of albumins increased and did not change further and did not differ from the indexes of the healthy animal (49.62 ± 1.77; p <0.001). There was also a decrease in the β- and γ-globulin levels to 10.86 ± 1.11 and to 23.62 ± 1.97, respectively. The albumin-globulin ratio increased to 0.99 ± 0.08 (p<0.001) and did not significantly change until the end of the experiments.

The quantity of β-globulins increased by the 14th day, compared to the 7th day of experiments by 3.78% (p<0.05) and remained at this level up to the 21st day of the experiments. The content of the α-and γ-globulins remained unchanged until the end of the experiments.

Within 7 days, the use of 1% avermectin paste gradually increased the blood serum glucose content to 11.08±0.36 mmol/L, which was 50.36% higher than the content in animals in which the medication was not used (5.38±0.08 mmol/L) (p <0.001). By the 14th day, there was a notable decrease of the glucose level in blood serumto 4.46±0.11 mmol/L. By day 21, the amount of glucose gradually rose to the normal level (5.16±0.14 mmol/L), which was similar to the finding in animals receiving no medication.

The alanine transaminase (ALAT) and aspartate aminotransferase (ASAT) enzymes are the most important biochemical parameters of liver function test. The activity of enzymes underwent significant changes under the influence of medications. The ASAT activity increased from 0.50 ± 0.01 to 0.79 ± 0.01 μkat/L (p<0.001) on the third day and the ALAT changed from 0.021 ± 0.001 to 0.03 ± 0.01 μkat/L (p<0.05), whereas enzymatic activity in the control group did not change significantly. By the seventh day, the ALAT activity increased to 0.084 ± 0.01 μkat/L (p<0.001) and the ASAT activity remained at the same level (0.74 ± 0.01). By the 14th day, the ALAT activity decreased to 0.032 ± 0.001 μkat/L (p<0.05), and the ASAT activity increased to 0.910 ± 0.04 μcat/L (p<0.001). These changes in the aminotransferase levels indicate there may be a hepatotoxic effect with the use of 1% avermectin paste.

Preventing of the intestinal infestation of horses should be directed on destroying the life cycle of the parasite and providing holding general and special veterinary and sanitary events. The complex of veterinary and sanitary actions consists of general economy and special veterinary and sanitary events.

DISCUSSION

This is the first study on the specific structure of intestinal helminths in Belarusian horses. Our study reports that the extensiveness of helminth invasion of horses in various sections of the digestive tract is 93.2%.

The purpose of our research experiments was to study the fauna of helminths in the intestinal tract of horses of Belarus, the distribution of intestinal parasitization in horses, and the effectiveness of domestic anthelmintics.

Based on the systematics of Chitwood and that of Scriabin,Yershova, and Dvoynos, the activities of the intestinal parasites was grouped, as follows [10]:

Type: Nemathelminthes

Class: Nematoda
Group: Rhabditata
Suborder: Strongylata
Family: Strongylidae
Line: Strongylus
Species: *Strongylusequines*
Line: Alfortia
Species: *Alfortiaedentatus*
Line: Delafondia
Species: *DelafondiaVulgaris*
Family: Cyathostomatidae (Trichonematidae)
Subfamily: Cyathostominae (Trichonematinae)
Line: Cyathostomum
Species: *Cyathostomumtetracanthum*
C. alveatum
C. pateratum
Line: Coronocyclus
Species: *Coronocycluscoronatus*
C. aegyptiacus
C. labiatus
C. labratus
C. sagittatus
Line: Cylicostephanus
Species: *Cylicostephanuscalicatus*
C. minutus
C. hybridus
C. longibursatus
C. goldi
Line: Cylicotetrapedon
Species: *Cylicotetrapedonbidentatus*
C. asymetricus
Line: Scrjabinodentus
Species: *Scrjabinodentuscaragandicus*
S. tshoijoi
Line: Cylicocyclus
Species: *Cylicocyclusradiatus*
C. adersi
C. auriculatus
C. brevicapsulatus
C. elongatus
C. insigne
C. leptostomus
C. nassatus
C. triramosus
C. ultrajectinus
C. largocapsulatus
C. matumurai
Line: Petrovinema
Species: *Petrovinemaskrjabini*
P. poculatum
Line: Cylicodontophorus
Species: *Cylicodontophorusbicoronatus*
C. euproctus
C. mettami
C. mongolica
Line: Poteriostomum
Species: *Poteriostomumimparidentatum*

P. ratzii
P. skrjabini
Line: Tridentoinfundibulum
Species: *Tridentoinfundibulumgobi*
Line: Hsiungia
Species: *Hsiungiapekingensis*
Line: Gyalocephalus
Species: *Gyalocephaluscapitatus*
Line: Caballonema
Species: *Caballonemalongicapsulatum*
Line: Cylindropharinx
Species: *Cylindropharinxbrevicauda*
C. dollfusi
C. intermedia
C. longicauda
C. ornata
C. rhodesiensis
Suborder: Ascaridata
Family: Ascaridae
Line: Parascaris
Species: *Parascarisequorum*
Class: Cestoda
Group: Cyclophyllidea
Family: Anoplocephalidae
Line: Anoplocephala
Species: *Anoplocephalamagna*
Anoplocephalaperfoliata

Symptoms of parasitic infection can be very different during the strongylata larval stage (especially during their migration) and pubertal stage. The symptoms also depend on the type of the activator, intensity of the invasion, and resistance to the organism [12,14].

Clinical signs of delafondios is depend on the intensity of the invasion and the developmental stage of the larvae. In foals, the disease proceeds sharply and is characterized by a fever up to 41°C, anemia, and dysfunction of the digestive tract [11]. Parasitizing of an animal in the larval stage gives rise to periodic attacks of gripes. Colic proceeds in mild or heavy forms. During the period of an attack of gripes in the mild form, an animas falls to the ground and turns onto its back. Body temperature, pulse, respiration virtually do not change. These signs disappear in 1–2 hours, and sometimes disappear within 1 day. In the severe form of colic, an animal falls to the ground, turns onto its back, and lies for an extended time with its extremities raised or the animal takes on the pose of a sedentary dog. Pulse and respiration become faster. The animal becomes sweaty, groans, its nostrils expand, and its body temperature increases to 40.5°C. Intestinal flatulence sometimes occurs. The excrement becomes watery, has a bad smell and with traces of blood. The affected animal gradually weakens and perishes in 3–4 days, or sometimes in 1–3 weeks with the phenomena of rough colic and strong sweating. Horses sometimes perish quickly as a result of blood vessel rupture. If blood clots were infected by putrefactive microflora, the animals have symptoms of chronic sepsis. When animals infested by larval stage of nematodes, they are depressed, retarded, delayed molting, swollen the joints of the limbs.[15].

Alfortiosis flows past sharply and chronically. A sharp current occursin foals. It is characterized by depression, refusal of forage, and anemia. Body temperature increases by 1°C–1.5 °C. At the time of palpation of the abdominal walls, foals are worried, look for tummy, lie often, cramps are registered. Many sick animals perish. Sick animals are exhausted and have a small appetite. Many animals can have colic, and mares may experience abortions.

Strongilosisis characterized by various clinical signs, which result from parasitizing during the larval stages in the pancreas. Stronglata in the thick section of horse intestines existin 100% of the horse livestock. Under the influence of an intestinal microflora in the large intestine, there is a splitting of a fat to fatty acids to

gassing. In the large intestine, there is also an absorption process of water and electrolytes. Nematodes from the Strongylidae and Trichonematidae (Cyathostomatidae) families damage the large intestine. First of all, the nematodes disrupt the absorption of water from the intestinal gleam, thereby considerably increasing the volume of the excrement. The colon mucosa under the influence of strongylida is irritated; there is consequently hyperplasia of the ferriferous cages, which are contained in it, and an increase in their secretion. The mucosal glands of colon then emit mucilage, and further development of inflammatory processes leads to the secretion of electrolytes and development of secretory diarrhea [6].

When parasitized by paraskaris, the clinical signs in foals are sharply expressed. In the first days after infection, violation of digestion occurs, which is reflected by diarrhea. Bronchopneumonia later develops, which is demonstrated by cough, increased respiration, short-term fever, and serous and mucous selections from nasal openings. The animal grows thin, tires quickly, and is oppressed. The mucosae become anemic. Sometimes spasms and paresis of the extremities occur. In adult animals, *Parascariosis*has subchronic form.

In the case of high intensive invasion at the anoplocephalidoses depression, an animal experiences exhaustion, decreased or total absence of appetite, and diarrhea. Body temperature increases to 40°C–41°C. Pulse and respiration increase. The mucosae become anemic. The animal has gripes and nervous phenomena (e.g., epilepsy). Quite often foals perish. In adult horses, the disease proceeds subclinically, and cause dysfunction of the digestive organs [13].

Based on the literary data, the modern anthelmintic medications to treat horses are alezan, alverm, ivermectin paste 1%, ivermectin powder, moxidectin, and alvet [16]. Fighting intestinal helminthiases of horses is generally conducted by chemical means. However, in spite of the fact that the quantity of medicines that are applied has increased annually, the problem of helminthiases remains unsolved. Problems of prophylaxis of these diseases at early stages of their emergence are not fully solved. Therefore, an important task is searching for new effective remedies that completely meet modern requirements.

CONCLUSIONS

The prevalence of helminths in the horse alimentary system substantially depended on the condition of keeping and on the age of the animal. Thirty types of nematodes exist, which includes 26 strongylata, and species in the Cyathostomatidae family. The dominating nematodes from the Strongylidae family are *Strongylusequinus, Delafondia vulgaris, Alfortiaedentatus, Triodontophorus serratus* and *Triodontophorusbrevicauda*; and from the Trichonematidae (Cyathostomatidae) family, *Cyathostomumtetrakanthum, Cylicocyclusnassatus, Cylicostephanuslongibursatus, Cylicostephanusgoldi, Cyathostomumpateratum, Cylicocyclus insigne, Cylicostephanusminutus,* and *Coronocycluslabiatus*. Highly effective anthelminths against intestinal helminthiases of horses are avermectin row (univerm, 1%rivertin, 1% avermectinpaste, equisect, etc.) and the benzimidazole series (albendazole, fenbendazole, etc.).

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