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Original papers

# Evaluation of the effectiveness of programs combating the invasions of strongyles (Strongylidae) in horses in selected stables of Western Pomerania

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**ABSTRACT.** The emergence of drug resistance among parasites is a side effect of the common use of chemotherapeutic agents in horses. Combating parasites typically involves routine deworming treatments twice a year (before and after the grazing season). However, in grazing farming this treatment may be insufficient. The aim of the study was to evaluate the effectiveness of programs to combat the invasion of strongyles (Strongylidae) in horses in the selected stables of Western Pomerania. Coprological examination was conducted in 85 horses from three stables located in Western Pomerania. Horses from all three stables remained in the pastures in the period from spring to late autumn, and deworming treatment was performed twice. The examination of horses has found nematodes of the family Strongylidae. The average prevalence of infection in horses in the studs tested was 36.16% for Strongylinae, and 58.49% for Cyathostominae. Administration of the medication twice did not eradicate the invasion of strongyles in the horses investigated. A significant reduction of strongyle invasion was observed directly after treatment, followed by rapid reinvasion. It appears necessary to monitor the effectiveness of deworming treatments by performing parasitological examination of feces. The participating stables should develop and implement new strategies to combat parasitic invasions in horses that will be adapted to the environmental conditions (the life cycle of parasites).

**Key words**: strongyles, horses, intestinal parasites, combating programs

## Introduction

Parasitoses are most common equine diseases [1–6], which cause disorders of the gastrointestinal tract, resulting in emaciation and weakness of the organism. Invasions in adult animals frequently have subclinical course or induce atypical symptoms, thus they are rarely diagnosed. However, in the case of foals and juveniles, they can pose serious health problems and even lead to death. The source of the invasion in young animals is often older individuals who are asymptomatic carriers of parasites [7].

Combating parasites typically involves routine deworming treatments twice a year (before and after the grazing season). However, in grazing farming this treatment is insufficient, because the animals have contact with invasive forms (mainly larvae) also in other periods [7]. Most of the horses are hosts for nematodes from families Strongylidae. In case of Cyathostominae (small strongyles or cyathostomins), they are widespread and present in virtually every herd. Even the well-maintained horses are exposed to invasive forms of these parasites [8–10].

The emergence of drug resistance among parasites is a side effect of the common use of chemotherapeutic agents in horses. According to Wędrychowicz [11], the emergence of drug resistance in horses is also caused by: drug underdosing, alternating the use of drugs belonging to the same group of compounds, too frequent contact of parasites with the active substance and mutual infection of animals with drug-resistant strains. The form and route of administration of the drug is important in the prevention and treatment of animals. The most common are applicator syringes that allow self-administration of the drug by the

carer. However, there is a risk of incorrect administration associated with wrong estimation of the weight of the animal. Veterinarians most frequently use combinations of active substances (alternately) in order to increase efficiency.

It should be noted that highly infected horses should be treated in stages. Gently acting agents should be applied in the first period of treatment that eliminate part of the parasites, followed by drugs with a broader spectrum of action. This prevents excessive excretion of parasites from the digestive tract and protects the animal from obstruction of the intestinal lumen [12]. Gawor and Kita [7] reported that treatment should be applied only to the horses excreting more than 200 eggs of strongyles in 1 g of feces. Deworming treatment should always be preceded by an examination of feces for the presence of parasites. Horses that were not positive for the presence of parasites should not be dewormed.

The aim of the study was to evaluate of the effectiveness of programs applied to combat the invasion of strongyles (Strongylinae, Cyathostominae) in horses in the selected stables of Western Pomerania.

## Materials and Methods

Coprological examination was conducted in 85 horses from three stables located in Western Pomerania. Horses in the period from spring to late autumn remained in the pasture in all three stables, and deworming treatment was performed twice.

The first herd (A) had a population of 50 horses, deworming treatment was carried out in May using Ivermectin with the active substance ivermectin, and in October using Equest Pramox, with active substances moxidectin and praziquantel. Ivermectin was administered once to all horses individually, by the oral route in a dose of 0.2 mg per 1 kg of animal body weight. Similarly, Equest Pramox was given individually to horses once also by the oral route in an amount of 400 μg/kg of moxidectin and 2.5 mg/kg of praziquantel. Stable and all equipment were cleaned and disinfected after deworming of horses.

The second herd (B) had a population of 25 horses, deworming treatment was carried out in April using Eqvalan, the active substance of which was ivermectin, and in September using Antiverm, with active substances pyrantel embonate. Eqvalan was administered once to all horses individually by the oral route, in a dose of 0.2 mg per 1 kg of animal body weight. Similarly, Antiverm was given individually to horses once by the oral route, in an amount of 19 mg/kg of animal body weight. Stable and all its equipment were cleaned and disinfected after deworming of horses.

The third herd (C) had a population of 10 horses and deworming treatment was carried out before the pasture season (March) using Panacur, which active substance was fenbendazole, and at the end of the season (November) using Grovermina, the active substance of which was ivermectin. Panacur was administered once to all horses individually by the oral route, in a dose of 7.5 mg per 1 kg of animal body weight. Similarly, Grovermina was given individually to horses once by the oral route, in an amount of 0.2 mg/kg of animal body weight. Feces of horses have been tested prior to drug administration and 14 days after deworming. Stable and all its equipment were cleaned and disinfected after deworming of horses.

Horses did not show any symptoms suggestive of infection and the condition of the animals was satisfactory. Care and feeding of horses was conducted according to generally accepted principles in the breeding of this species.

The experimental material consisted of feces samples collected from each horse once a month in an annual cycle. A total of 410 feces samples have been examined, of which 154 were from the stable A, 138 from the stable B, and 118 samples came from the stable C.

The prevalence of infection was the number of excreted eggs in 1 g of feces (EPG) evaluated based on the coprological examination using the method of Willis-Schlaf and Mc-Master [13]. The percentage of small and large strongyles in the parasitic fauna of horses have been determined on the basis of the identification of the invasive larvae of these nematodes. Identification of the larvae of small and large strongyles was performed according to method described by Henriksen and Korsholme [14].

## Results

The result of the examination of horses was the identification of nematodes of the family Strongylidae. The tests have shown that the prevalence of infection of horses with Strongylinae (36.16%) was lower in comparison to Cyathostominae (58.49%) The average prevalence of infection with small

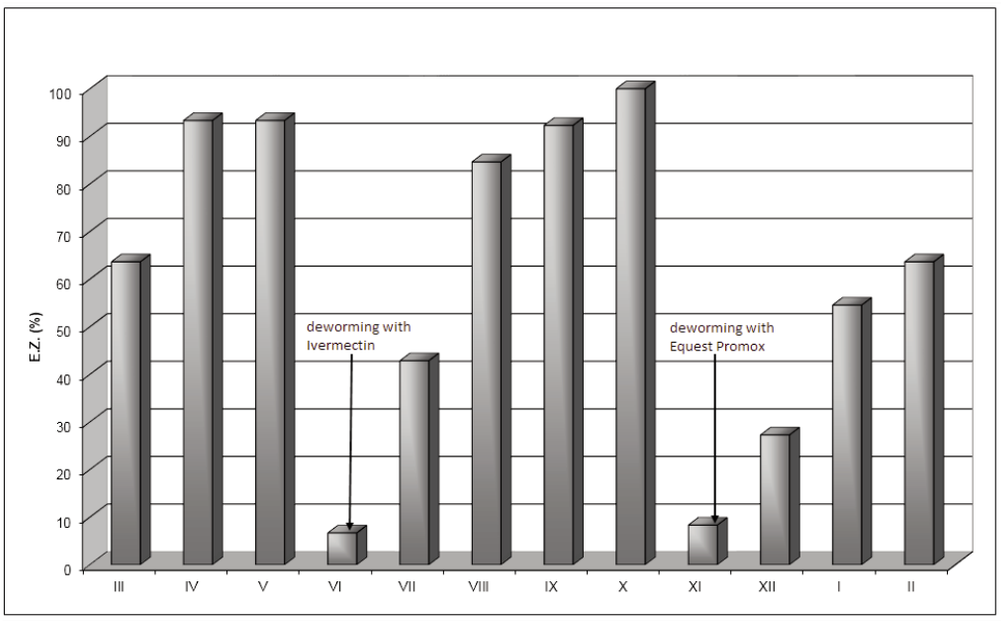


Fig. 1. The average prevalence of strongyle infection in horses in the annual cycle in stud farm A

strongyles in the individual stables was as follows: A – 61.69%, B – 53.62%, C – 60.17%, and for the large strongyles: A – 42.21%, B – 28.99%, C – 37.29%.

The average prevalence of infection with strongyles in an annual cycle in the individual stables is presented in Figs 1–3. The highest average prevalence of infection was found in horses from stable A (61.69%), while lowest in stable B (53.24%).

The average prevalence of infection in horses from stable A, dewormed in May (Ivermectin), was 6.67%, while in July it has already increased to 42.86%. Horses dewormed in October (Equest Promox) had average prevalence of infection at the level of 8.33% in November, while in December it was 40.91% (Fig. 1).

The average prevalence of infection in horses from stable B, dewormed in April (Eqvalan), was 8.33%, while in July it has already increased to 63.64%. Horses dewormed in September (Antiverm) had average prevalence of infection at the level of 8.33% in November, while in December it was 41.67% (Fig. 2).

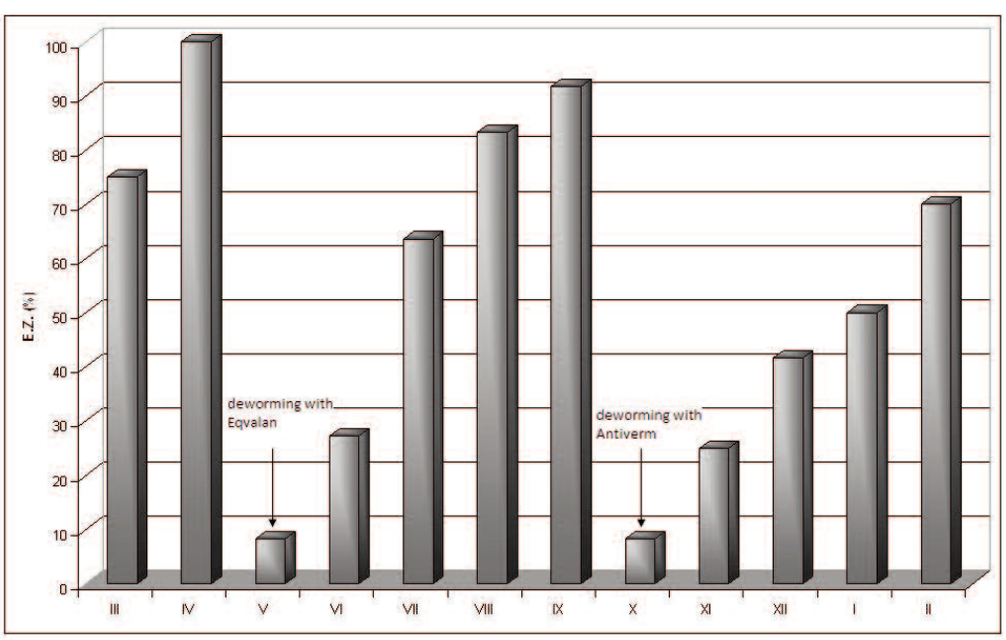


Fig. 2. The average prevalence of strongyle infection in horses in the annual cycle in stud farm B

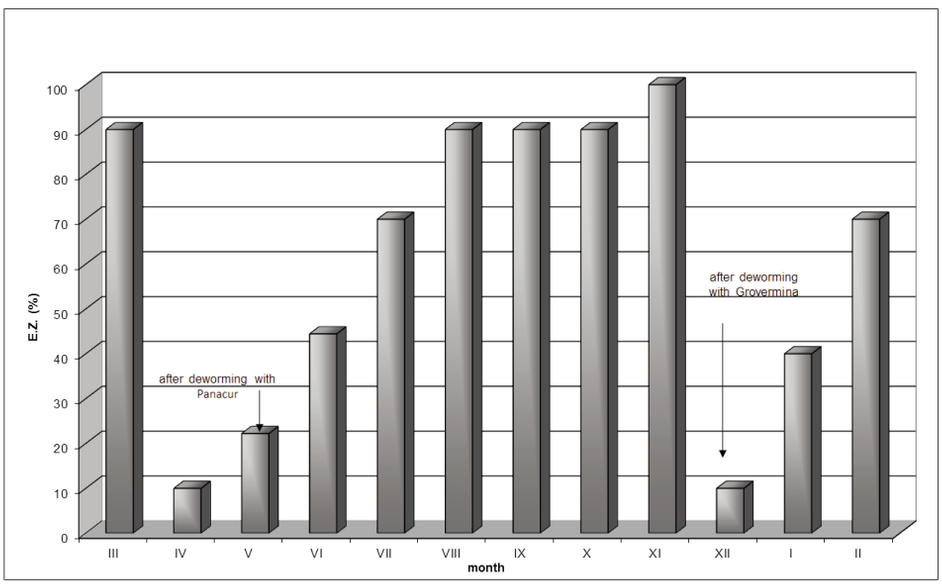


Fig. 3. The average prevalence of strongyle infection in horses in the annual cycle in stud farm C

The average prevalence of infection in horses from stable C, dewormed in March (Panacur), was 10%, while in July it has already increased to 70%. Horses dewormed in November (Grovermina) had average prevalence of infection in that month at the level of 10%, while in December it was 40% (Fig. 3).

The highest annual average EPG was found in the stud C – 1307 eggs in 1 gram of feces, and the lowest in horses from the stud B (1057 EPG). The average annual EPG in the stud A was 1250 eggs in 1 gram of feces.

Our study showed that the greatest intensity of strongyle infection in the stud A was found in October (2046 EPG), while the lowest in June and November, after deworming (225 EPG) (Fig. 4).

The greatest intensity of strongyle infection in the stud B was found in April (1600 EPG), while the

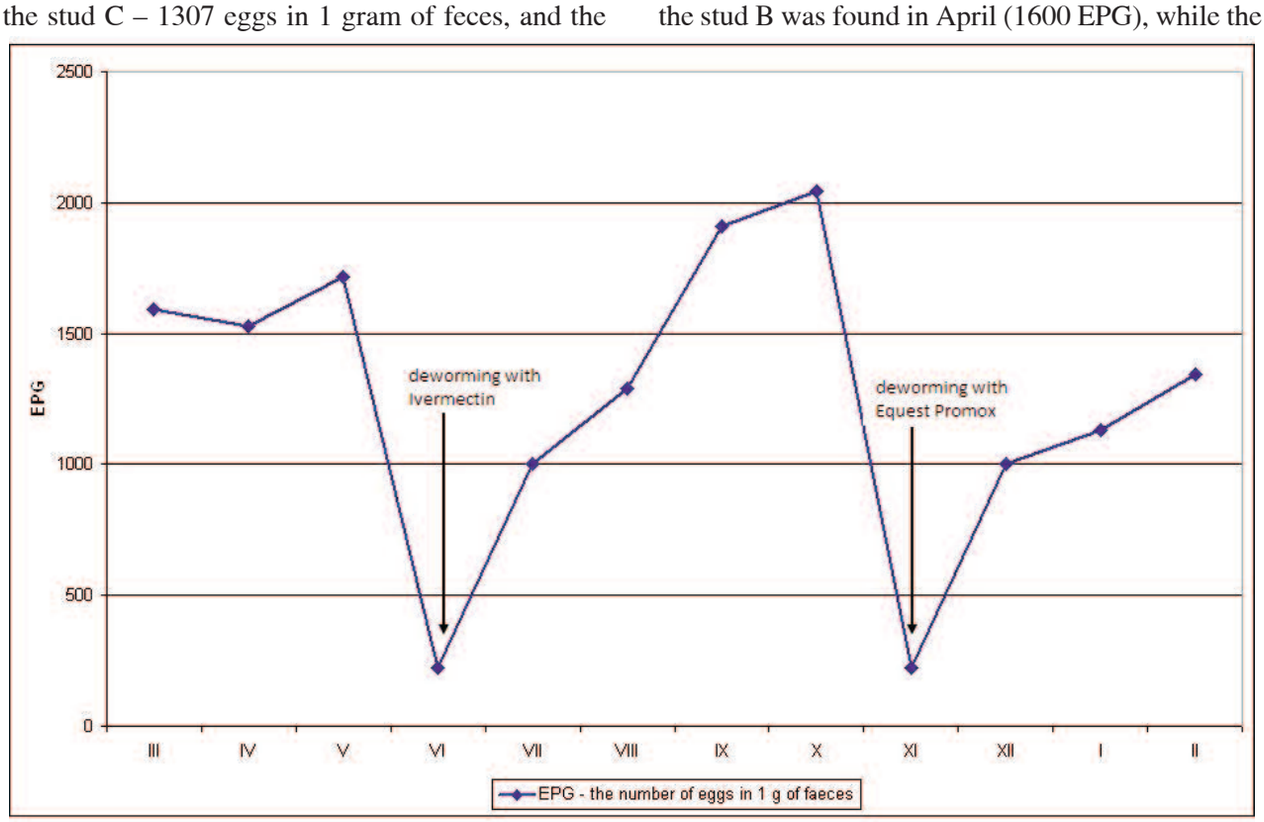


Fig. 4. The average EPG in stud farm A

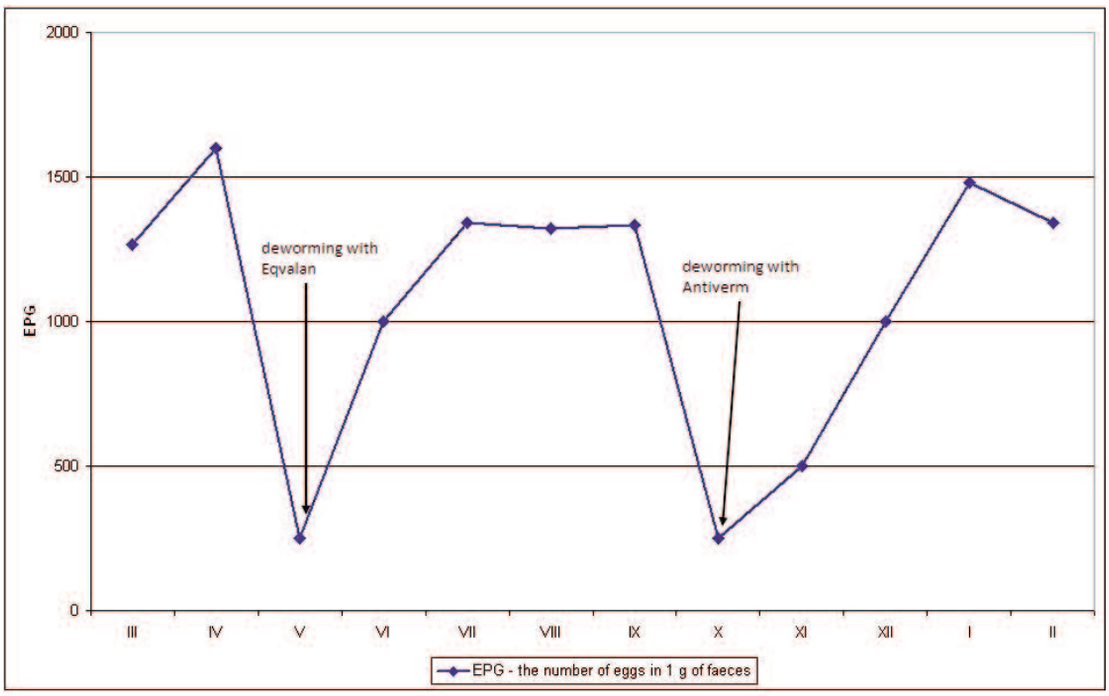


Fig. 5. The average EPG in stud farm B

lowest in May and October, after deworming (250 EPG) (Fig. 5).

The greatest intensity of strongyle infection in the stud C was found in November (2029 EPG), while the lowest in April and December, after deworming (225 EPG) (Fig. 6).

## Discussion

The average prevalence of strongyle infection in horses from the test studs was high. The results obtained in the present study are similar to findings of Jagła et al. [15]. These authors showed in horses from the Opole voivodeship and Wrocław, the

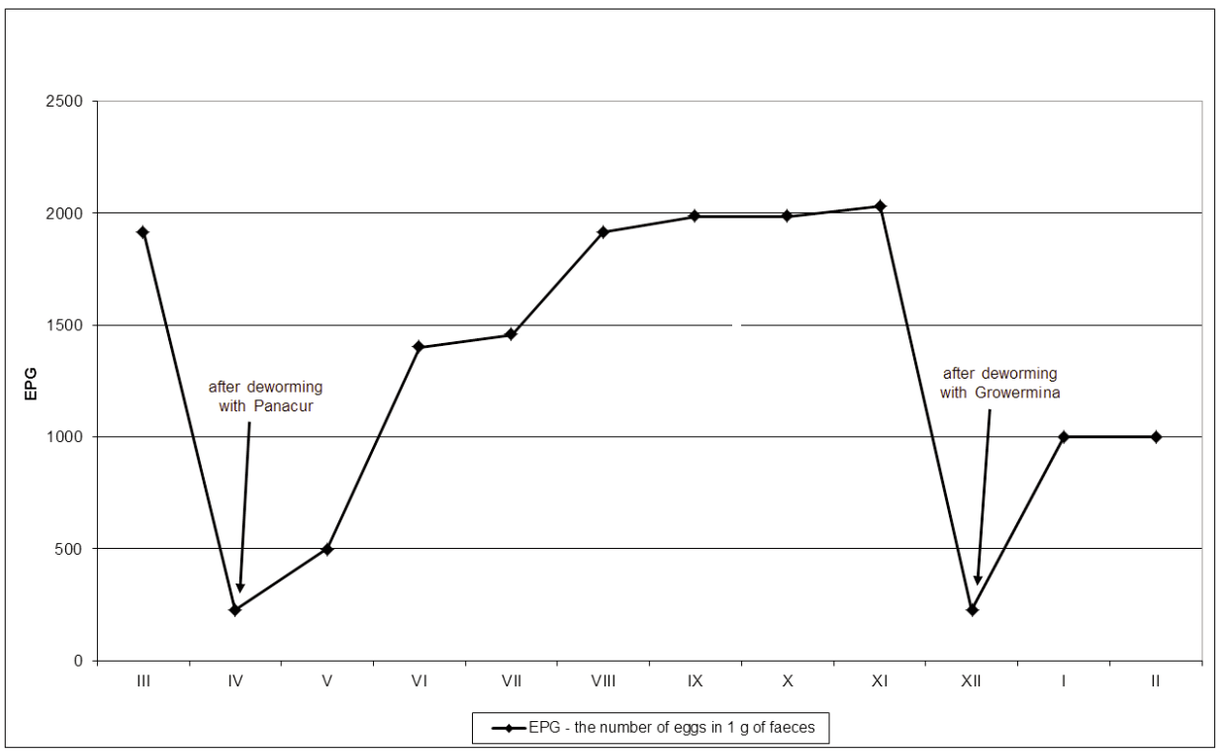


Fig. 6. The average EPG in stud farm C

average prevalence of infection at the level of 62.6%, which was also consistent with the results (53.66%) of the study by Kornaś et al. [16]. However, the results acquired by other authors were significantly higher. Pilarczyk et al. [17] found 100% prevalence of parasitic infection of the gastrointestinal tract in Polish Konik horses derived from Poland and imported from the Netherlands. The presence of nematodes from the subfamilies Strongylinae and Cyathostominae and species *Parascaris equorum* was reported in Polish Konik horses imported from the Netherlands, while in domestic Polish Konik horses, the presence was found of nematodes from the subfamilies Strongylinae and Cyathostominae and protozoa *Cryptosporidium* sp. In a study conducted by Kornaś et al. [18] the average prevalence of horses' infections with strongyles ranged from 84.4% to 95%. Romaniuk [19] also noted the occurrence of nematode eggs in the two-year-old mares and stallions at the level of 100%, and 83.3% in foals.

Two parasitic species belonging to small (Cyathostominae) and large strongyles (Strongylinae) were found in the animals studied. The highest average prevalence of infection was found in the stud A (61.69%), slightly lower was observed in the stud C (61.02%), while the lowest values were recorded in the stud B (53.24%). The occurrence of parasites in horses is an important epizootiologic problem also in other countries [20–24]. The average prevalence of infection of horses with Strongylinae and Cyathostominae in our study was significantly lower compared to the values obtained by other authors. Pilarczyk et al. [17] found that the average prevalence of infection of Polish Konik horses imported from the Netherlands with small strongyles (Cyathostominae) was 94.74%, and with large strongyles (Strongylinae) 89.47%. Herds of Polish origin had the average prevalence of infection with both groups amounting to 100%. Gawor et al. [24] found that the prevalence of infection with small strongyles in horse riding clubs was in the range of 36.3% to 87.1%, and in the studs 71.0%. These authors detected large strongyles only in 1.2% of the animals investigated. According to Betlejewska [25], the highest prevalence of infection of horses with small strongyles was observed in March and at the end of the grazing season (August-November). The study of Kuzmina et al. [26] reported that small strongyles occurred in 100% of tested horses in Ukraine. The largest species percentage was attributed to *Cylicocyclus nassatus* (36.3%) and *Cyathostomum catinatum* (17.6%). Among large strongyles, most common was *S. vulgaris* (27.3%). Lower prevalence of infection was found *for S. equinus* (15.9%) and *S. edentatus* (13.6%). The study by Collobert-Laugier et al. [27] reported the presence of small strongyles in 93% of horses in France. Most common species were *Cyathostomum coronatum* (69%), *Cylicocyclus nassatus* (69%) and *Cylicocylus insigne* (53%).

In our study, we found a greater prevalence of infection of horses with Cyathostominae (58.49%) compared to Strongylinae (36.16%). Most authors believe that Strongylidae in regularly dewormed horses are not clinically significant, because all anthelmintics effectively remove mature intestinal forms and migrating larvae (L4 *Strongylus vulgaris* in mesenteric arteries, *S. equinus* in the liver and pancreas and *S. edentatus* underneath the peritoneum) [5,7]. However, combating parasites of Cyathostominae group is currently a major problem due to the phenomenon of resistance to benzimidazoles and pyrantel [28,29].

A significant reduction of strongyle invasion in the horses studied was observed directly after treatment, followed by the rapid reinvasion. Romaniuk and Jaworski [30] also obtained similar results. These authors have found that horses after one month of deworming had a decreased prevalence of infection from 100% to 19%, and an increase to 71% in the following month of the study. Comparably low efficiency of the strongyle treatment in horses was also reported by Romaniuk et al. [30] and Betlejewska [25]. Kornaś et al. [18] and others [25] were deworming horses twice a year using Panacur, Antiverm and Ivermectin and did not obtain satisfactory results either. The authors draw attention to the need for administration of anthelmintic preparations that would effectively eradicate adult parasites and their migrating and resident larvae in the tissues. Conducting deworming treatment twice a year in our study proved to be insufficient, because the animals had contact with invasive forms (mainly larvae). Similar results were also obtained by Little et al. [20] and Lyons et al. [29]. Deworming did not remove in all investigated horses the Cyatostominae parasites, but significantly reduced the intensity of infection in these animals. Complete removal of the invasion of small strongyles (Cyathostominae) in a population of infected horses, according to Lyons et al. [29] and Tarigo-Martinie et al. [31], is impossible due to the effect of hypobiosis, i.e., the presence of

larvae with arrested development (L4) in the colonic mucosa.

Effective prevention of parasitic diseases in horses should rely on proper care of pastures and paddocks (regular waste removal, and thus the destruction of developmental stages of parasites), stables (regular disinfection) and the systematic and planned deworming (active substances of the preparations). Currently, most experts recommend deworming four times a year in adult horses. O'Meara et al. [32] proposed the introduction of deworming programs to reduce the frequency of these procedures, alternation of anthelmintics, accurate calculation of the doses administered and monitoring the resistance of parasites to treatment.

In conclusions, the assessment of the course of strongyle invasion in horses bred in stable grazing system showed that the double treatment have not significantly limited the invasion of parasites (rapid reinvasions). Traditional strategies of combating infestation in horses, mainly based on the use of drugs, are not effective. Therefore, veterinarians and breeders should pay more attention to the quality of dewormings and stable disinfections. It appears necessary to monitor the effectiveness of deworming treatments by performing parasitological examination of faeces. Such testing provides information about the effects of deworming, and in case of detection of parasites allows to select the proper medication and method of treatment. The participating stables should develop and implement new strategies to combat parasitic invasions in horses that will be adapted to the environmental conditions (the life cycle of parasites).

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