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IVERMECTIN RESISTANCE OF HORSE DIGESTIVE STRONGYLES

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Abstract

Lately, much has been said about ivermectin resistance to digestive horse strongilide infections. Often, the owners of the horses choose the animal to do deworming, without sending first the coprogram to the laboratory for the test. It is believed that misidentifying antihelmetic and inappropriate doses result in the strongilide ivermectin resistance.

Our goal was to investigate whether the ivermectin resistance was observed in horses in Latvia. The tasks were as follows: collecting faecal samples, examining them, calculating the quantity of an invasion, identifying resistance. The study was launched in March 2018.

In the study, we used 49 horses from the age of five, different sexes and types of use (sport, hobby etc). Horses were from different districts of Latvia (Jelgava, Riga, Jekabpils, Aizkraukle region). All animals were clinically healthy - rectal temperature, respiration rate, heart rate, condition of the animal were determined. Horses were examined for coprology specimens. Samples were obtained from each horse rectal, faeces put into sterile plastic bags, each individually identified (animal identification number, age, gender), and transported in a cold box at plus 4^0 C to the laboratory for investigation. Samples were examined at the Laboratory of Veterinary Medicine at the Parasitology Laboratory using the flotation method. The egg number is set per gram of faeces after McMaster (P. Keidans, 2008).

Depending on the results obtained and the volume of the invasion, 23 positive horses were given an ivermectin-containing paste. The dose is adapted to the individual weight of each horse. Repeated faecal samples were taken after 14 days. Samples were examined by flotation method, and the number of eggs re-diagnosed per gram of faeces after McMaster.

We can conclude that an extension of digestive strongylid infestation in horses included in the study was 46.9%, while the intensity of infestation was 804 eggs per gram of faeces. Digestive strongilidosis is a topical infestation for horses in Latvia. Ivermectin has a high potency of 100%. After dehelminthization on day 14, no digestive strongylide eggs were diagnosed in coprological samples. High efficiency of dehelnithization has shown that resistance to ivermectin in digestive strongilides has not developed recurring use of this anthelmintic agent for horses.

Key words: horses, strongyles, ivermectin, resistance.
JEL Codes: I19; Q01; Q18.

Introduction

Horse digestive strongilidosis is a common infestation for horses kept in pasture. Invasion is triggered by nematodes - digestive strongyles. Indigestion of strongylus is divided into two groups - large and small strongylides. Large strongilid species are: *Strongylus vulgaris, Strongylus equinus, Strongylus edentatus.* Small strongylides are more than 50 different species of several genera, but most of the small strongylides belong to four main genera - *Cyatostomum, Cylicocyclus, Cylicodontophorus* and *Cylicostephanus*. Although small strongylides do not belong to the same genus, it is permissible that they are called ciatostomas (Clark, 2008). Adult strongylides are found in the colon, but the third and fourth grade larvae of the large strongylids migrate to different organs - blood vessels, lungs, trachea, bronchi, liver, pancreas and other depending on species and larval stages development (Junquera, 2017; Reinemeyer, Nielsen, 2013).

Digestive strongylides are found throughout the world. Depending on the region and the climate, 90% of the horses may be infected with these parasites. In recent years, the use of intensive antimicrobials has reduced the incidence of severe strongylides, but the increase in the intensity of small strongylides has been associated with cyatastome resistance to various anti-helmintic agents (Junquera, 2017; Gokbulut et al., 2010; Francisco et al., 2009). Some authors point out in their works that uncontrolled, incorrectly used ivermectin drugs in some countries have remained ineffective against digestive strongylides (Junquera, 2017; Gökbulut 2010; Kaplan, Nielsen, 2010; Papadopoulos et al. 2010).

The **purpose** of our work was to investigate ivermectin resistance to horse digestive strongylides infestation in Latvia. The following **tasks** have been put forward:

1. To find out the extent and intensity of digestive strongylide infestation in horses under study.
2. To find out the intensity of digestive strongylides after the use of ivermectin for horses.
3. To clear up the length of the reinvasion period for horses after deworming with ivermectin.

The **research object** is the digestive strongylids of horses.

Material and methods

The study started in March 2018. Forty nine horses of different sexes and age (at least two years old) from Jelgava, Riga, Jekabpils and Aizkraukle regions have been selected. All horses, according to the oral statements of their owners over the last five years, were at least four times (in spring and autumn) treated with ivermectin-containing anti-parasitic agents.

At the beginning of the study, coprograms for the diagnosis of parasites were laboratory tested for horses. A faecal sample was taken for each horse, taken rectally, placed in a plastic bag and identified.

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During the transportation, the coprological material was stored in a frozen box at + 4ºC. After delivery to the laboratory, samples were stored in the refrigerator at + 4ºC until the time of the investigation. All collected samples were laboratory tested within 48 hours. Investigations were performed at the Parasitology Laboratory of the Faculty of Veterinary Medicine of the LUA.

Digestive strongylids had been diagnosed using flotation (Keidans et al., 2008). To judge the degree of infestation, the strongylid eggs were counted in MacMaster's chamber.

In the study, only the horses with gastrointestinal strongylid infestation were included in the evaluation of ivermectin's efficacy. In general, there were 23 horses. All horses were clinically healthy.

Ivermectin-containing paste18.7mg/g, PO 0.2 mg/kg live weight was used for deworming of the horses.

To evaluate whether deworming had been successful, coprograms and intensity of digestive strongylides were fixed on the third, seventh and 14th days (the formula for determining intensity is shown in Figure 1).

$$a = (b - c) \times 100 / b$$

where: *a – intensity (%);*
b – number of eggs (before deworming);
c – number of eggs (14 days after deworming).

Figure 1. Formula for determining intensity (Nielsen, 2015)

In order to clear up the period of re-invasion with digestive strongylides, horses were re-sampled for laboratory examination on the 20, 40 and 60 days after deworming. During the study, 210 coprological samples were investigated.

Microsoft Excel-2010 program was used for data statistic processing. Average arithmetic values and standard deviation were calculated.

In order to determine the level of infestation for horses, the extensity of invasion as a percentage and intensity of invasion was calculated.

Results

Our results have shown that horse digestive strongylides is a topical invasion in Latvia (see Figure 2).

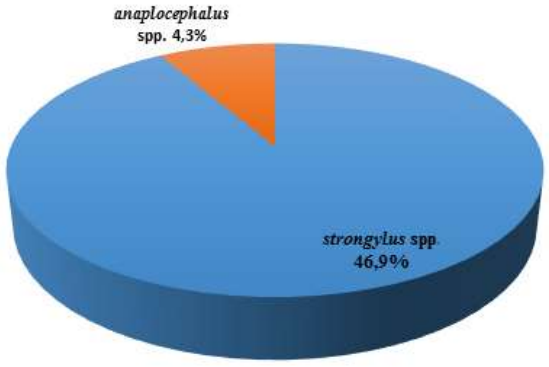

Figure 2. Extensity of parasitic infections (%)

Diagnosed digestive strongylide extensity of invasion was 46.9 %.

We also diagnosed cestoze (*Anaplocephala* spp.) invasion with an infestation extension of 4.3% (see Fig. 2) in the studied horses. It is noted in literature that, in other European countries, digestive strongylide infestation is one of the main invasions of horses (Kaplan and Nielses 2010; Kaplan, 2002).

Results after ivermectin paste administration to horses are shown in Figure 3.

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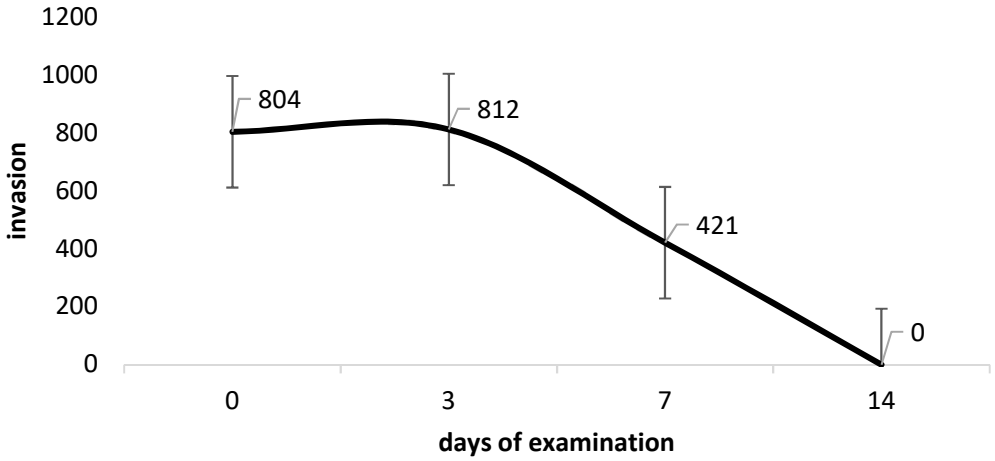

Figure 3. Results after dehelminthization with ivermectin paste

Beginning of the study, the number of strongylide eggs per g faeces was 804. Examining coprological samples in the laboratory on the third day after ivermectin administration, we found that the intensity of the invasion has slightly increased to 812 eggs per 1 g faeces. This increase of invasion is most probably due to intensive removal of strongylide eggs from the body's external environment. It is noted in the literature that, after dehelminthisation, the release of parasite eggs in the external environment takes place up to the sixth day (Ralston 2015; Gokbulut et al 2010). Therefore, it would be important not to move horses immediately after deworming to new pastures.

When investigating coprological samples on the seventh day after dehelminthisation, we observed a rapid invasion decrease; the number of strongylides was 421 eggs per g of faeces.

On the 14th day after dehelminthization digestive strongylides were not diagnosed in any coprological samples and reached the intensity of 100%. In the Nielsens study on drug efficiency, it has been noted that 99.9% must be reached to consider dehelminthisation with ivermectin successful. If the efficacy of ivermectin on day 14 after dehelminthisation is <95% then dehelminthisation is considered to have failed or a resistance of parasites has developed.

In order to determine duration of ivermectin impact and in what period of time horse reinvasion with strongylides may occur, we continued to investigate coprological samples of the horses. The results of the research are shown in Figure 4.

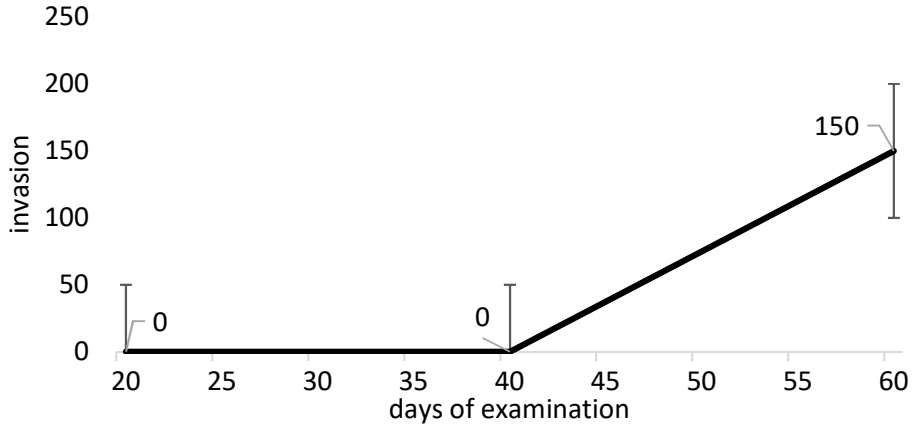

Figure 4. Reinvasion time after dehelminthization with ivermectin paste

As we see, on the 60th day after dehelminthisation, we diagnosed strongylide invasion with 150 eggs in 1 g of faeces. In the Nielsen study, ivermectin reinvasion period was from six to eight weeks. If this period is shortened, it is considered that there starts a resistance to the used drug in the farm (Nielsen, 2015, Ralston 2015). In our case, we can assume that resistance to ivermectin has not been established in horses included in the study.

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We also noted that great importance for invasion of parasites is horse's age. The highest invasion of digestive strongylids was for 4 to 7 year old horses. This could be explained by a stressful period in their lives (beginning of training, first competition, change of owners etc.)

Conclusions

Results obtained in the study:

1. An extension of digestive strongylid infestation in horses included in the study was 46.9%, while the intensity of infestation was 804 eggs per gram of faeces. Digestive strongilidosis is a topical infestation for horses in Latvia.
2. Ivermectin has a high potency of 100%. After dehelminthization on day 14, no digestive strongylide eggs were diagnosed in coprological samples.
3. After deworming with ivermectin paste, the reinvasion of horses appeared again on the 6th week.
4. High efficiency of dehelnithization has shown that resistance to ivermectin in digestive strongilides has not developed despite the two-year-old, recurring use of this anthelmintic agent for horses.

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