Scientific Works. Series C. Veterinary Medicine. Vol. LXVII (2), 2021
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

PARASITOLOGICAL INVESTIGATIONS IN AN ARABIAN HORSE BREEDING FARM IN ROMANIA

Anca BULGARU[1], Dragoş LUPU[1], Horia DINU[2], Elena NEGRU[2], Mihai DANEŞ[3]

[1]S.C. Antem Total Trading S.R.L., 23 Giuleşti Road, 6th district, Bucharest, Romania;
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, 105 Splaiul Independentei, District 5, Bucharest, Romania
[3]Spiru Haret University, Faculty of Veterinary Medicine, 256 Basarabia Avenue, District 2, Bucharest, Romania

Corresponding author email: anca.floarea@ymail.com

Abstract

Endoparasite control is one of the major challenges of equine health management, and requires constant surveillance. The present study aimed to investigate the prevalence of intestinal parasites in an Arabian horse breeding farm. Of the 115 samples examined by flotation and sedimentation methods, 69 (60%) were positive for parasitic infestation. The prevalence of Strongylidae was 35.65%, Parascaris equorum 19.13% and Eimeria leuckarti 23.47%. An initial treatment with ivermectin paste (20 mg/ 100 kg) was administered to all the animals positive for helminth infestation. Two weeks after the treatment, samples were collected and examined again, using the same methods. The prevalence of Strongylidae decreased to 6.95%, while the prevalence of Parascaris equorum remained close to the initial value, at 18.26%. Horses tested positive for Parascaris were treated with fenbendazole paste (7.5 mg/kg), leading to a decrease in prevalence to 2.60%. The remaining horses received a second dose of ivermectin, which had no effect on the prevalence of Strongylidae infestation. As a final result, we changed the control program for endoparasites from scheduled prophylactic treatment "in blind" every three months, to a control program based on diagnosis and monitoring of therapy.

Key words*: anthelmintics, equine parasites, Parascaris equorum, Strongylide.*

INTRODUCTION

Arabian horse breeding has a long history and tradition, being one of the first equine breeding practices to ever be documented (Lewis, 2016). The breeding of top-quality show horses depends largely on the proper management of several factors, such as nutrition, hygiene, environmental factors and health status, particularly endoparasite control (Matthee, 2003).

Horses are prone to infestation with multiple parasite species that can impair the animal's health and well-being. In contemporary establishments, subclinically infested horses are one of the hidden sources that can generate and maintain contamination of the environment. Subclinical parasitism is often difficult to detect, since the animals appear normal, however, it can be associated with poor performance, such as diminished growth rates in young animals, reduced reproductive rates in mares and can even impair the balance of the immune system, all of which can translate into high management costs for the breeder (ESCCAP, 2019).

Studies have demonstrated that treating horses "in blind" for parasite infestation can be more costly and detrimental to the animals' health then implementing a customized parasite control program, based on diagnosis and fecal egg count reduction tests (Kaplan, 2009). Also, rotational deworming has been proved to promote anthelmintic resistance, by the selection pressure under which sensitive parasites are eliminated and the resistant ones survive and reproduce (Nielsen et al., 2014).

The aim of this study was to determine the prevalence of intestinal parasites in an Arabian horse breeding ranch and to implement an evidence-based approach for the treatment program.

MATERIALS AND METHODS

The investigations were carried out from November 2020 to January 2021 in an Arabian Horse breeding farm, in Giurgiu County, Romania. At the time, the horse population consisted of 95 Pure Breed Arabian horses - 23 foals, ages 3 to 18 months and 72 adult horses.

Also on the farm lived 20 Haflinger mares which were used as surrogates in the reproduction process. The Arabian horses included prized animals, used for breeding purposes, and occasionally for participating in beauty competitions around the world. The horses were subject to a prophylactic deworming schedule every three months, using commercially available products containing ivermectin, praziquantel and pyrantel pamoat. Prior to anthelmintic administration, the horses' weight was only estimated, not determined precisely. Also, parasitological examinations had never been performed on the farm, the prophylactic treatments were done blindly, therefore, there was no data available concerning the efficacy of the deworming program.

In order to determine the existing parasitological burden in the horse population, fresh fecal samples were collected from each horse. The samples were labeled and examined immediately in the establishment's parasitological laboratory. Examinations were carried out by flotation method using supersaturated saline solution to reveal the presence of light parasite eggs and larvae and by sedimentation method for heavy eggs (such as tapeworm eggs and *Eimeria* spp. oocysts). A McMaster counting chamber was used to perform fecal egg counts (FEC) in order to determine the degree of infestation (number of eggs per gram of feces - EPG) of the positive samples. Based on the FEC, the horses were categorized into low (<200), moderate (200-500) and high (>500) worm egg shedders (Kaplan, 2009). The horses were also tested for *Oxyuris equi* infestation using the scotch test method, by applying a transparent adhesive tape to the skin of the perianal region, and them removing and examining it microscopically. The horses with positive samples were administered an oral paste containing ivermectin, according to the producer's specifications, after each horse was weighed individually, on a livestock scale. All the positive horses were dewormed during the first phase of the treatment schedule, regardless of their FEC results. Two weeks after the initial treatment, the parasitological examinations were repeated and the horses still positive for *Strongylidae* infestation received a second dose of ivermectin paste. The horses that tested positive for *Parascaris* infestation after the first treatment (mainly the young horses), received a fenbendazole based product for the second treatment. Two weeks after the second treatment, fecal samples were collected again and FECs were performed to determine the efficacy of the treatment schedule.

RESULTS AND DISCUSSIONS

The initial parasitological exams revealed that 69 of the 115 horses were positive for parasitological infestation. The highest prevalence was noticed for parasites belonging to the *Strongylidae* family (35.65% - Figure 1); *Parascaris equorum* (Figure 2) registered 19.13% and *Eimeria leuckarti* 23.47%.

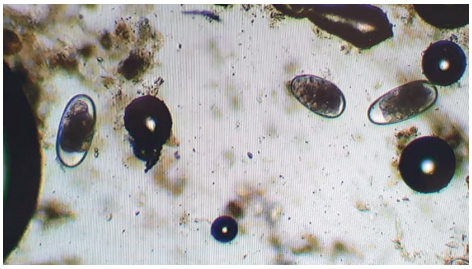

Figure 1. Strongyle eggs identified by flotation method (100x)

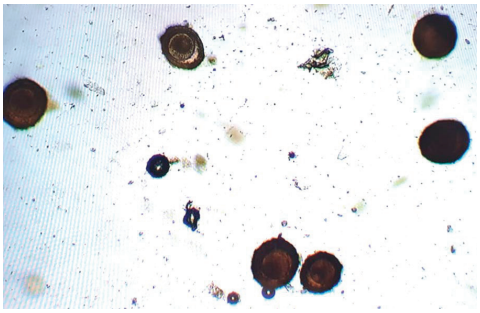

Figure 2. *Parascaris equorum* eggs identified by flotation method (100x)

Although 20 of the adult horses presented characteristic symptoms of pinworm infestation, such as pruritus and tail-rubbing, the diagnosis of *Oxyuris equi* infestation could be confirmed by the scotch test method only for one of the horses (0.87%). Of the 22 samples positive for *Parascaris equorum*, 12 were collected from foals and the remaining 10 were from adult mares.

Of the 69 positive samples, 18 presented poly-parasitic infestation (2 or 3 genera of parasites identified in the same sample). The results of the initial examinations are summarized in Table 1.

Table 1. Prevalence of intestinal parasites at initial examinations

Specification	Number	Percentage
Number of samples	115	
Positive samples	69	60%
Samples positive for *Strongylidae*	41	35.65%
Samples positive for *Parascaris equorum*	22	19.13%
Samples positive for *Eimeria leuckarti*	27	23.47%
Samples positive for *Oxyuris equi*	1	0.87%
Horses infested with a single genre of parasites	41	35.65%
Horses infested with 2 genera of parasites	14	12.17%
Horses infested with 3 genera of parasites	4	3.47%

The fecal egg counts revealed that the majority of the strongyle infested horses were low (70.80 mean EPG) or moderate eggs shedders (355 mean EPG), and only a small percentage had severe infestations (950 mean EPG). Most of the horses infested with *P. equorum* had an EPG of over 200 with a mean of 335, and a few were high egg shedders, with an mean EPG of 687.5 (Table 2).

Table 2. Results of the initial fecal egg count: number of horses categorized into low, moderate or high egg shedders

Parasite genus/ species/ family	Low egg shedders (<200 EPG)	Moderate egg shedders (200-500 EPG)	High egg shedders (>500 EPG)
Strongylidae family	27	11	3
Parascaris equorum	5	15	2

Contrary to information provided by literature (Dubey and Bauer, 2018), *E. leuckarti* was identified mostly in adult horses, both male and female, and despite the high percentage of positive samples, the number of oocysts shed in feces was very low. No *Anoplocephala* spp. eggs were found during the examinations, despite the fact that all the horses have access to pastures occasionally.

Since there were no data available on the potential anthelmintic resistance on the farm, an ivermectine based product was chosen for the treatment of all the horses who tested positive for helminth infestation. The ivermectine was chosen considering its efficacy against both adult and larval stages of large and small strongyles (Cernea, 2008).

The second parasitological examination revealed that 8 horses (6.96%) were still positive for *Strongylidae* infestation. All of the positive samples had an EPG of under 100. During the 14 days following the first treatment, some of the horses that tested positive for *P. equorum,* shed adult roundworms in their feces (Figure 3).

However, the prevalence of roundworm infestation remained close to the initial value, at 18.26% (21 positive horses), showing only a decrease in EPG values. The prevalence of *E. leuckarti* was 12.17% (Table 3).

Figure 3. Adult *Parascaris equorum* worms shed after initial deworming

Table 3. Prevalence of intestinal parasites after the first treatment

Specification	Number	Percentage
Number of samples	115	
Positive samples	36	31.3%
Samples positive for *Strongylidae*	8	6.95%
Samples positive for *Parascaris equorum*	21	18.26%
Samples positive for *Eimeria leuckarti*	14	12.17%
Samples positive for *Oxyuris equi*	0	0%
Horses infested with a single genre of parasites	28	24.34%
Horses infested with 2 genera of parasites	8	6.95%
Horses infested with 3 genera of parasites	0	0%

After the second dose of ivermectin was administered to the strongyle positive horses, there was no major decrease in the prevalence of *Strongylidae* (6.08%), nor the EPG values. After treating the *P. equorum* positive horses with fenbendazole paste the prevalence of infestation decreased to 2.60% (Table 4). It was decided not to treat the *Eimeria* positive horses considering several factors: the oocysts were identifies only in samples taken from adult horses (none of the foals tested positive for *E. leuckarti*), that showed no symptoms of eimeriosis, and the shedding of oocysts was inconsistent. Also, none of the adult horses that tested positive for *E. leuckarti* were in direct contact with the foals at the time, therefore, the risk of contamination for the young horses was low. Of the 115 samples examined, 5 (4.35%) were positive for *E. leuckarti* infestation even though no treatment was administered for coccidiosis.

Table 4. Prevalence of intestinal parasites after the second treatment

Specification	Number	Percentage
Number of samples	115	
Positive samples	11	9.56%
Samples positive for *Strongylidae*	7	6.08%
Samples positive for *Parascaris equorum*	3	2.60%
Samples positive for *Eimeria leuckarti*	5	4.34%
Samples positive for *Oxyuris equi*	0	0%
Horses infested with a single genre of parasites	7	6.08%
Horses infested with 2 genera of parasites	4	3.47%
Horses infested with 3 genera of parasites	0	0%

The prevalence of intestinal parasites found in the initial study, before and for the purpose of designing the therapeutic protocol was high (69%), compared to a similar study carried out in Bucharest and Ilfov county in 2015, that revealed a prevalence of 28.57% for helminth infestation in pure breed horses kept in similar conditions (Bulgaru and Tudor, 2015). However, surveys carried out in other regions of the country revealed similar results to the current study. For example, in 2013, Ionita et al. found a prevalence of 87.97% for parasitic infestation in two stud farms from center and northeastern Romania.

A study on working horses from villages in the northeastern and southeastern parts of the country, showed a prevalence of intestinal parasites of 70.3% (Buzatu et al., 2013). Different results were obtained by a study on horse population located in Western Romania, Arad County, where the prevalence of parasite infestations was 100%, with a 73.21% prevalence for digestive strongyles, 28.57% for *P. equorum*, 12.50% for *O. equi* (Morariu et al., 2012). Also, both studies cited above reported positive results for *Strongyloides westeri* and *Anoplocephala* spp., parasites that were not found in the horses included in the present study.

Parasite control is a global concern among scientists and horse breeders. In Italy, a study on strogyle infestations in horses found a 39.5% prevalence of strongyle egg shedding, with 86.4% of the stables investigated having at least one positive animal (Scala et al., 2020).

A literature review on parasites of equines in Iran revealed a pooled prevalence of parasitic infestations of 28.8%, with helminths having the highest prevalence (47.6%) (Khamesipour et al., 2021). Parasitological investigations carried out on horses living in a tropical climate, in Cuba, determined a prevalence of 97% for strongyles and 10% for *Parascaris* spp. (Salas-Romero et al., 2017).

Despite the fact that the horses subjected to the current study were being dewormed regularly and frequently before the start of the study, the percentage of infested horses found in the initial examinations was very high. A similar deworming schedule (in blind treatments, every three months, with the rotation of anthelimintics) applied in a stable from Bucharest yielded very different results, with a prevalence of helmith parasites of 6.67% (Bulgaru and Tudor, 2015).

The high prevalence of intestinal parasites in the investigated farm appears to be the result of the related action of some factors, such as: the subjective approximation of weight could lead to under-dosing of anthelmintics, which represents a risk factor for the development of drug resistance (Matthee, 2003); even though the overall health of the horses was closely monitored at all times, no coproparasitological

exams were performed to assess the parasitelogical infestation status of the animals. It has been proved that appropriate monitoring of the parasitic infestation, considering the biology of the parasites and parasite-host interactions is essential for the efficacy of the control schedule (Kaplan, 2009; Nielsen et al., 2014; Buzatu et al., 2015).Parasitological surveillance of the herd is imperative because animals from other countries are regularly introduced into the herd, each one of them harboring its own parasitological fauna. A study carried out on 40 horse farms in Brazil showed that more than 50% of the farmers introduce newly acquired horses on their properties without performing any prior examinations, and only 38.5% of the farmers used quarantine as a precautionary measure (Rosa et al., 2018).

CONCLUSIONS

Of the 115 samples examined, 60% were positive for parasitic infestation. The prevalence of digestive strongyles was 35.65% before treatment, and dropped to 6.08% after two anthelmintics administrations.

P. equorum infestation was identified in 19.13% of the tested animals. The first treatment with ivermectin paste was unsuccessful, however, after the second treatment with fenbendazole paste, the prevalence decreased to 2.60%.

The prevalence of *E. leuckarti* varied between the 3 exminations performed, even though no treatment was administered showing a inconsistency in oocyte shedding.

At the end of the investigations described in the current study, the prevalence of intestinal parasites on the farm had decreased to 9.56%

The conclusions of this study demonstrate the effectiveness of considering antiparasitic therapy as an action to be undertaken into a surveillance and monitoring program.

The study represents the first step in establishing an effective program for controlling internal parasites on the farm.

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