

A survey on helminth infections of equines in the Central Black Sea region, Turkey

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Abstract: This study was carried out to determine the prevalence of helminth species in horses, donkeys, and mules in the Central Black Sea region, between March 2004 and July 2005. For this purpose, 140 faecal samples were taken from horses (n = 83), donkeys (n = 31), and mules (n = 26) in Samsun, Sinop, Ordu, Amasya, and Tokat provinces. Infection rates were 91.57% (76 of 83) in horses, 96.77% (30 of 31) in donkeys, and 96.15% (25 of 26) in mules. The parasite species and their prevalence in examined animals were as follows: in horses *Strongylidae* spp. 77.10%, *Parascaris equorum* 14.45%, *Fasciola* spp. 4.82%, *Oxyuris equi* 1.20%, *Anoplocephala* spp. 1.20%, *A. perfoliata* 1.20%, *A. magna* 1.20%, and *Dicrocoelium dentriticum* 1.20%; in donkeys *Strongylidae* spp. 96.77%, *P. equorum* 22.58%, *Strongyloides westeri* 22.58%, *Fasciola* spp. 16.13%, *Dictyocaulus arnfieldi* 9.67%, *O. equi* 6.45%, *Anoplocephala* spp. 6.45%, *D. dentriticum* 3.22%, and *Draschia/Habronema* spp. 3.22%; and in mules *Strongylidae* spp. 96.15%, *P. equorum* 15.38%, *Fasciola* spp. 11.53%, *Probstmayria vivipara* (adult) 3.84%, and *A. perfoliata* 3.84%. Faecal cultures from horses, donkeys, and mules showed infection rates of *Cyathostomum* spp. (33.88%, 63.79%, 69.07%), *Strongylus edentatus* (31.05%, 8.62%, 5.15%), *S. equinus* (6.11%, 6.03%, 1.03%), *S. vulgaris* (3.52%, 3.01%, 8.76%), *Gyalocephalus* spp. (12.0%, 0.86%, 5.15%), *Poteriostomum* spp. (5.88%, 1.72%, 6.70%), and *Triodontophorus* spp. (1.41%, 3.01%, 4.12%), respectively. *Trichostrongylus axei* was not found in mules, and *S. westeri* was found (8.18%) only in donkeys.

Key words: Equine, helminth, Black Sea, Turkey

Orta Karadeniz bölgesi tektırnaklılarında helmint enfeksiyonlarının araştırılması

Özet: Bu çalışma Orta Karadeniz bölgesi tektırnaklılarında helmint enfeksiyonlarına neden olan türlerin dağılımını ortaya koymak amacıyla yapılmıştır. Bu amaçla, Mart 2004 - Temmuz 2005 tarihleri arasında Samsun, Sinop, Ordu, Amasya, Tokat il ve ilçelerindeki köylere gidilerek 83 at, 26 katır ve 31 eşek olmak üzere toplam 140 tektırnaklı hayvandan dışkı örneği alınmıştır. Çalışmada genel olarak atların 76'sı (% 91,57), katırların 25'i (% 96,15) ve eşeklerin 30'u (% 96,77) helmintlerle enfekte bulunmuştur. Enfekte hayvanlarda bulunan parazit türleri ve yaygınlık oranları; atlarda *Strongylidae* spp. % 77,10, *Parascaris equorum* % 14,45, *Fasciola* spp. % 4,82, *Oxyuris equi* % 1,20, *Anoplocephala* spp. % 1,20, *A. perfoliata* % 1,20, *A. magna* % 1,20 ve *Dicrocoelium dentriticum* % 1,20; eşeklerde *Strongylidae* spp. % 96,77, *P. equorum* % 22,58, *S. westeri* % 22,58, *Fasciola* spp. % 16,13, *Dictyocaulus arnfieldi* % 9,67, *O. equi* % 6,45, *Anoplocephala* spp. % 6,45, *D. dentriticum* % 3,22 ve *Draschia/Habronema* spp. % 3,22; katırlarda ise *Strongylidae* spp. % 96,15, *P. equorum* % 15,38,

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Fasciola spp. % 11,53, *Probstmayria vivipara* (ergin) % 3,84 ve *A. perfoliata* % 3,84 olarak saptanmıştır. Strongylidae türleri ile enfekte dışkı kültürlerinden elde edilen larvaların dağılımında at, eşek ve katırlarda sırasıyla *Cyathostomum* spp. (% 33,88, 63,79, 69,07), *Strongylus edentatus* (% 31,05, 8,62, 5,15), *S. equinus* (% 6,11, 6,03, 1,03), *S. vulgaris* (% 3,52, 3,01, 8,76), *Gyalocephalus* spp. (% 12,0, 0,86, 5,15), *Poteriostomum* spp. (% 5,88, 1,72, 6,70) ve *Triodontophorus* spp. (% 1,41, 3,01, 4,12) oranlarında görülmüştür. Katırlarda *Trichostrongylus axei*'ye rastlanamamış ve *S. westeri* yalnız eşeklerde % 8,18 oranında tespit edilmiştir.

Anahtar sözcükler: Tektırnaklı, helmint, Karadeniz, Türkiye

Introduction

The Black Sea region of Turkey has mountainous terrain. Houses are located distant from each other, and equines (horses, donkeys, and mules) are often used for transport and farm work. Although equine numbers have been decreasing in Turkey, the Black Sea region still has a considerable number. According to official data, there were 761,130 equines in Turkey in 2002, including 79,625 (10.46%) in the Central Black Sea region (1).

Parasitic helminths, especially strongyle nematodes, are commonly found in the large intestines of equines and can cause diseases with consequences ranging from ill-thrift to sudden death (2-8). Some species such as *Anoplocephala perfoliata* (9), *Parascaris equorum* (10), and Cyathostominae (11) can cause several health problems. In most European countries, especially France, the equine industry is economically important, and there have been many anthelmintic control programs and/or immunity studies (12), and management programs have been implemented in South Africa (13). However, in Turkey, equine owners generally have very low incomes and most of them know little or nothing about the health effects of parasitic infections. Due to their expensiveness, the use of anthelmintics is limited. Consequently, owners do not use them regularly and there is no parasite control programme in this region.

A number of studies have shown the prevalence of equine helminths in Turkey (14-19) and different countries throughout the world (5,13). Burgu et al. (3,4) reported 1 trematode, 1 cestode, and 35 nematode species in donkeys and 1 cestode and 37 nematode species in horses in Turkey.

The aim of the present study was to determine the prevalence of equine helminths in naturally infected horses, donkeys, and mules in the Central Black Sea region in Turkey. According to the authors this is the first study on the prevalence of equine helminths in this region.

Materials and methods

Animals: This study was conducted between March 2004 and July 2005. Faecal samples were collected from Samsun (Çarşamba-Yamalı and Terme-Ahmetbey villages), Sinop (Aktaş and Sazlı villages), Ordu (Perşembe-Ramazan, Töngeldüzü, Yeniköy and Yumrutaş villages), Amasya (Direkli village), and Tokat (Kadıvakfı village) provinces. In total, 140 faecal samples were collected from 83 (66 old, 17 young) horses, 31 donkeys (24 old and 7 young), and 26 mules (21 old and 5 young). Most faecal samples were taken rectally, but some samples (especially from temperamental animals) were collected from fresh deposits. Animals 3 years old and older were considered old.

All animals were examined clinically before the faeces samples were taken and the required data (sex, age, owner, etc.) were recorded. All collected faeces were stored in plastic containers and examined by the standard flotation and sedimentation method, with the exception of the Baermann Wetzel method for *D. arnfieldi*. All the eggs were identified based on egg morphologies and measurements according to the literature (20-22). The faecal egg counts were performed using a modified McMaster technique with a 50 eggs per gram (EPG) sensitivity (20). In equines 500 EPG suggests a mild infection, 800-1000 a moderate infection, and 1500-2000 a severe infection (20).

Larval cultures: In order to identify the strongyle genera/species, third stage larval (L₃) cultures were prepared from all of the infected material, with the standard procedures. The infective third stage larvae were recovered from the samples using a modified Baermann analysis. The larvae were fixed with Lugol's iodine solution. Identification and descriptions of L₃ were done by the method described by Soulsby (20) and Georgi and Georgi (21).

Statistical analysis: The data were analysed using the chi-square test according to the age and sex of animals (9).

Results

After collating the data across provinces, general infection rates were 91.57% (76/83) in horses, 96.77% (30/31) in donkeys, and 96.15% (25/26) in mules. The overall prevalence rate was 93.57% (131/140) in equines. A total of 20 helminth genera/species (2 trematodes, 2 cestodes, and 16 nematodes) were found in both faecal examination and larval cultures in equines. The helminth species and their prevalence rates are given in Tables 1 and 2. In addition, 4 horses and 3 donkeys were infected with *Eimeria* spp., and 2 donkeys with *E. leuckarti*.

Table 1. Prevalence of helminth parasites (%).

| Parasite species | Horse (n: 83) | Donkey (n: 31) | Mule (n: 26) |
|---------------------------------|------------------|-------------------|-----------------|
| <i>Fasciola</i> spp. | 4.82 | 16.13 | 11.53 |
| <i>Dicrocoelium dendriticum</i> | 1.20 | 3.22 | - |
| <i>Anoplocephala</i> sp. | 1.20 | 6.45 | - |
| <i>A. perfoliata</i> | 1.20 | - | 3.84 |
| <i>Strongylidea</i> | 77.10 | 96.77 | 96.15 |
| <i>Parascaris equorum</i> | 14.45 | 22.58 | 15.38 |
| <i>Strongyloides westeri</i> | - | 22.58 | - |
| <i>Oxyuris equi</i> | 1.20 | 6.45 | - |
| <i>Probstmayria vivipara</i> | - | - | 3.84 |
| <i>Draschia megostoma</i> | - | 3.22 | - |
| <i>Dictyocaulus arnfieldi</i> | - | 9.67 | - |

Table 2. The number of Strongylidae eggs in equids.

| Animal species | Age groups | | | | | |
|----------------|----------------------|----------|----------|----------------------|-----------|-----------|
| | Youngsters (Age ≤ 3) | | | Adults (Age >3) | | |
| | Infection intensity* | | | Infection intensity* | | |
| | Light (%) | Mild (%) | High (%) | Light (%) | Mild (%) | High (%) |
| Horse | 7(46.6) | 3(20) | 5(33.33) | 14(28.57) | 10(20.4) | 25(51) |
| Mule | 1(20) | 1(20) | 3(60) | 7(35) | 4(20) | 9(45) |
| Donkey | 3(42.85) | 3(42.85) | 1(14.28) | 3(13) | 10(43.48) | 10(43.48) |
| Total | 11(40.74) | 7(25.9) | 9(33.3) | 24(26) | 24(26) | 44(47.82) |

* According to EPG

Strongylidae species were the most common helminth group (Tables 1 and 2). *Parascaris equorum* and *Fasciola* spp. were observed in all animals, but *S. westeri* and *D. arnfieldi* were observed only in donkeys (Table 1). Infected adult equids with *P. equorum* were 12/111 (10.8%) and youngsters 10/29 (34.48%). There was a significant difference between adults and youngsters ($P < 0.05$).

The rates of large and small strongyle species larvae are presented in Table 3. The most pathogenic species was *S. vulgaris*, with rates between 3.01% and 8.76%. However, no clinical signs due to helminthosis were observed in any examined animals.

In terms of age and sex, no significant differences were found between infected animals ($P > 0.05$), except for *P. equorum*.

Discussion

According to previous studies in various provinces in Turkey, general infection rates by equine helminths were detected between 41.66% and 100% based on coprological examination (2,17,23) and/or necropsy (6,24). In this study, as in previous studies, the mean infection rate was 93.57% in equines.

The prevalence of *D. dendriticum* and *Fasciola* spp. was reported to be at low levels in equines in Turkey (16). Arslan and Umur (2) reported the prevalence of *Fasciola* spp. to be 1.6% in horses in Kars (faecal examination). Demir et al. (16) reported *Fasciola* spp.

in 1.6% of horses and 1.3% of donkeys and *D. dendriticum* in 1.1% of horses and 7.2% of donkeys in Bursa province. Another study showed that the rate of *Fasciola* sp. infection was 0.9% in horses and donkeys and that *D. dendriticum* infection was 0.9% in donkeys (17). In the current study, the level of infection by *Fasciola* spp. was 4.82% in horses, 16.13% in donkeys, and 11.53% in mules. The *D. dendriticum* infection rate was 1.20% in horses and 3.22% in donkeys. There was no *D. dendriticum* infection in mules.

Anoplocephalidae species, especially *A. perfoliata*, are the cause of intestinal diseases such as caecal intussusceptions, caecal perforations, and peritonitis, but are rarely the cause of death (9). The prevalence of these cestodes was high in the United States (7), but low in Turkey (25). The prevalence of Anoplocephalidae eggs was determined to be 1.17%-3.3% in horses and 1.9%-8.5% in donkeys in Turkey (2,15,16). The prevalence of *A. perfoliata* was reported to be 0.2%-15.8% in horses and 8%-20% in donkeys (4,6,26). In this study, the prevalence of *Anoplocephala* spp. was 1.20% in horses and 6.45% in donkeys; *A. perfoliata* was found in 1.20% of horses and 3.84% of mules.

Parascaris equorum infections are commonly associated with signs of lethargy, inappetence and coughing, nasal discharge, and decreased weight gain (10,20). The prevalence of ascariasis was high in young equines (7) and their prevalence was 1.38%-

Table 3. The ratios of strongyle larvae in faecal cultures (%).

| Species | Horse (%) | Donkey (%) | Mule (%) |
|------------------------------|-----------|------------|----------|
| <i>Cyathostomum</i> spp. | 33.88 | 63.79 | 69.07 |
| <i>Strongylus edentatus</i> | 31.05 | 8.62 | 5.15 |
| <i>S. equinus</i> | 6.11 | 6.03 | 1.03 |
| <i>S. vulgaris</i> | 3.52 | 3.01 | 8.76 |
| <i>Gyalocephalus</i> spp. | 12.0 | 0.86 | 5.15 |
| <i>Poteriostomum</i> spp. | 5.88 | 1.72 | 6.7 |
| <i>Triodontophorus</i> spp. | 1.41 | 3.01 | 4.12 |
| <i>Trichostrongylus axei</i> | 1.88 | 4.31 | - |
| <i>Strongyloides westeri</i> | - | 8.18 | - |
| Unidentified | 2.82 | - | - |

35.8% in horses, 2.6%-42.85% in donkeys, and 5.8% in mules (16,18,27). The prevalence of *P. equorum* was 14.45% in horses, 22.58% in donkeys, and 15.38% in mules in this study. When the animals' ages were taken into consideration, the prevalence of this parasite was higher in younger animals (52.63%) than in older animals (12.12%) ($P < 0.05$). Strongylidae nematodes exist at very high rates in equines in Turkey (3,4) and worldwide (20). Sometimes the prevalence of these nematodes reaches 100% (2). These nematodes could not be identified from their egg morphologies. Therefore, in this study faecal cultures were prepared for genus or species identification. The authors found the prevalence of Strongylidae to be 77.10% in horses, 96.77% in donkeys, and 96.15% in mules. Öge (26) reported the prevalence of the *Trichonema* spp. at 89.2%, *S. vulgaris* at 1.08%, and *S. edentatus*, *Triodontophorus* spp., *Poteriostomum* spp., *S. equinus*, *Oesophagodontus* spp., and *Gyalcephalus* spp. at less than 1% in faecal cultures from 1897 horse samples. Gülbahçe and Cantoray (27) determined the prevalence of *Trichonema* spp. at 76.8%, *S. vulgaris* 61.0%, *S. edentatus* 52.4%, *Poteriostomum* spp. 13.8%, and *Triodontophorus* spp. 9.8% in horses from Konya province. The same researchers reported *Trichonema* spp. at 100%, *S. vulgaris* at 42.9%, and *S. edentatus* at 14.3% in donkeys in the same area.

According to the faecal cultures in this study, the most common genus was *Cyathostomum* (33.88%-69.07%) and the pathogenic large strongyle species ranged between 1.03% and 31.05% in all equines.

Strongyloides westeri was seen especially in horse foals and donkey foals because it is one of the earliest maturing nematode species in equines (7,20). *S. westeri* was reported in Kars district at 4.9% and 9.8% (2), and at 5.8% and 13.6% in different regions of Turkey (17) in horses and donkeys, respectively. Demir et al. (16) reported the prevalence of the same helminth at 11.7% in mules in the Bursa region. In this study, the prevalence of this parasite was highest in donkeys (22.58%) in Turkey. However, there was no correlation between age and prevalence. This species was not encountered in horses and mules. Possible reasons for this situation may be immunity and the ages of examined animals. Foals usually develop a satisfactory immunity against *S. westeri*

infection by 15-23 weeks after birth (20). However, the prevalence of the parasite in donkeys remained over 30% until 3 years age (13).

Oxyuris equi was detected in 0.39%-30% of horses and 0.9%-30% of donkeys in Turkey (3,4,17,27). The same nematode was identified in 1.20% of horses and 6.45% of donkeys in this study. The reason for these low rates when compared to previous studies may be a consequence of not using cellophane while collecting the faeces samples.

Probstmayria vivipara is a viviparous nematode that has less important health impacts in equines (21). The prevalence of this parasite in Turkey was 0.4%-3.3% in horses and 0.6%-80% in donkeys (2,4,16). In the present study, the prevalence was only 3.84% in mules.

Trichostrongylus axei, *Habronema muscae*, *H. majus*, and *Drachia megastoma* have been reported in the stomachs of equines (6,24,28). The prevalence of these parasites varies with the animal species, age, and geographical location. In Turkey, the prevalence of *T. axei* was 4.3%-40% in horses, 1.8%-50% in donkeys, and 83.3% in mules (2-4,24), and the prevalence of *D. megastoma* was 9.69% in horses and 5.88% in mules (29). The authors found the infection rates of *T. axei* to be 1.88% and 4.31% in horses and donkeys, respectively. However, *Draschia/Habronema* spp. was found only in donkeys (3.22%).

The prevalence of *D. arnfieldi* was reported to be 1.17%-1.73% in horses and 0.6%-14.6% in donkeys in Turkey (2,14,15). The prevalence of this parasite in donkeys was 9.67% in this study. The donkey is the only natural host for this parasite; hence it was not detected in mules and horses in this study.

Control of helminths is an important issue for equine owners. Anthelmintic treatment has to be used along with a pasture and herd management system (13). It has been stated that the inappropriate use of anthelmintic medications will cause resistance in the near future (23).

In summary, 20 helminth genera/species (2 trematodes, 2 cestodes, and 16 nematodes) were found in equines in this study. The general infection rate in equines was high (131 of 140), although no clinical signs of helminthosis were observed in examined animals. Due to the general high rates of

parasitic infection in equines in the Black Sea region, it is recommended that owners regularly treat their animals with the appropriate anthelmintic and strictly according to its directions for use.

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