
A survey on Cyathostominae nematodes (Strongylidea, Strongylidae) in pasture bred horses from São Paulo State, Brazil

Nematóides Ciatostomíneos (Strongylidea, Strongylidae) em eqüinos criados a pasto no Estado de São Paulo, Brasil

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Abstract: By previous fecal examinations, 14 naturally nematode infected equine hosts were selected from horse-breeding farms in Jaboticabal County, São Paulo State, Brazil. The animals were divided in two experimental groups according to age: seven animals, 12 to 24 months old, were allotted to the Young Group and the other seven equines, all of them with more than 60 months old, constituted the Adult Group. One week later all 14 equine hosts were slaughtered and the separate contents, plus a thorough scraping, of each section of the gastro-intestinal tract (stomach, small intestine and large intestine), were collected. Nematodes from every segment were identified, sexed and counted, and emphasis was put on the Cyathostominae found in the large intestine. The prevalent Cyathostominae species found were carefully studied. From the total of 537,128 nematodes collected from the 14 animals of both age groups, 80.5% belonged to the Cyathostominae sub-family (small strongyles). From these, 72.64% came from the Young Group hosts and the remaining 27.36% from the Adult one. The hosts of the Young Group harbored 22 species of Cyathostominae, while those of the Adult Group had only 14 species. This study points out the higher prevalence of the Cyathostominae among the nematode parasites of equines from the studied area in Brazil.

Key words: Cyathostomes, horses, age.

Resumo: Foram selecionados, por meio de exames coprológicos, 14 eqüinos naturalmente infectados por nematóides, oriundos de haras do município de Jaboticabal, São Paulo, Brasil. Os animais foram distribuídos em dois grupos experimentais de sete animais cada, conforme a faixa etária: entre 12 e 24 meses (jovens) e com mais de 60 meses de idade (adultos). Após uma semana, os 14 equinos foram necropsiados e todo conteúdo e raspado de cada segmento do trato gastrintestinal (estômago, intestinos delgado e grosso) foram recolhidos. Os nematóides presentes em todos segmentos anatômicos foram identificados, sexados e contados. Foi dada ênfase aos Cyathostominae encontrados no intestino grosso. De um total de 537.128 nematóides recuperados dos 14 animais necropsiados, 80,5% pertenciam à sub-família Cyathostominae (pequenos estrôngilus). Destes, 72,64% foram encontrados nos equinos jovens e os 27,36% restantes nos animais adultos. Os animais jovens apresentaram 22 espécies de Cyathostominae, enquanto os adultos apresentaram apenas 14 espécies. Este estudo aponta a maior prevalência de ciatostomíneos, entre os nematóides parasitos, principalmente em equinos de 12 a 24 meses de idade, oriundos da região estudada.

Palavras-chave: Ciatostomíneos, faixa etária, eqüinos, nematóides.

1 Introduction

Scientific emphasis on the Cyathostominae nematode group the increased in the last 15 years greatly due to the clinical evaluation of parasitism (REINEMEYER, 1986; HERD, 1990). In the last twenty years the search for anthelmintic efficiency of drugs against the Strongylidae as a group has been conducted, but the contemporary tendency is to face the problem at an individual species level (REINEMEYER, 1986).

After outlining the problem of cyathostomiasis, unduly kept, for over half a century in Brazil as a matter of low relevance, this study represents a conscient effort, following the leadership of Lanfredi (1983), to try and restore the scientific priority given to it by Vaz in the

decade of 1930-39. Within this spirit, the long term goal of the project is parasite control, mostly of nematodes, in domestic equids. However, as such a control has never been wholly achieved anywhere, its fulfillment may be considered a remote possibility, to be reached through several intermediary steps, one of which is a precise knowledge of the worm species present in each situation.

In this paper are results of a study of taxonomic and quantitative nature, comparing the helminth populations found at *postmortem* examinations of naturally infected horses belonging to two age groups, young and mature animals respectively, all of which were from the Jaboticabal area.

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Nematodes other than Cyathostominae recovered from the hosts were of 10 different species (Table 2). In the young group (12 to 24 months old) the only species not was *Crasterostomum acuticaudatum*, while in the mature group (over 60 months old) *Parascaris equorum* and *Strongylus vulgaris* were not present.

The 10 species of nematodes other than Cyathostominae recovered in this study were: *Trichostrongylus axei*, *Habronema muscae*, *Parascaris equorum*, *Triodontophorus* spp, *Strongylus vulgaris*, *Strongylus edentatus*, *Gyalocephalus capitatus*, *Oxyuris equi*, *Craterostomum acuticaudatum* and *Anoplocephala perfoliata*.

4 Discussion

The main species of Cyathostominae found in horses from Jaboticabal county were practically the same as found in other countries and the similarity of results of this survey with others show that the prevalence of several of these species remain stable. This suggests that if a change in population levels occurred it was slight and could be attributed to the advent of modern anthelmintic drugs.

Lanfredi (1983) called attention to disagreements between lists of species prepared by Theiler (1923), Lichtenfels (1975) and Ogbourne (1976), respectively, stating that such discrepancies occur because either some of those species are more common in *Equus asinus*, than in *Equus caballus*, or some species are "rare" or even "very rare" at the areas where most of the surveys were conducted. As an example of such a situation, in this study *Poteriostomum imparidentatum* was detected in animals of the young group, a species also found by Lichtenfels (1975) but not by Lanfredi

(1983) or Ogbourne (1976), even when this last author examined 83 equine hosts. It must be emphasized that *P. imparidentatum* was found in only one host of the young group, in a total of 1,600 parasites (less than 1% of the group's parasites burden). In many papers published prior to 1975 a separation of parasites found in *Equus asinus* and *Equus caballus* was not considered. It is still a controversial point if there exists any cross-infection between these two host-species for all or any of their parasitic cyathostomine species (LANFREDI, 1983). Several foreign papers also testify to the importance of the Cyathostominae (HERD, 1990, UHLINGER, 1990, HERD, 1991, MAIR, 1993).

Concerning Cyathostominae genera recognized in the 14 equids used, the results of this study show that some of these species differ statistically in young and adult groups of hosts by the Fischer's Exact Test. These were: *Coronocyclus coronatus*, *Cylicocyclus ashworthi*, *Cylicocyclus elongatus*, *Cylicocyclus leptostomum*, *Cylicocyclus radiatus*, *Cylicostephanus minutum* and *Cylicocyclus calicatum* (Table 1). The total counts of Cyathostominae specimens (Table 2) showed no significant difference according to statistical analysis between young and adult groups suggesting that these parasites infect their individual hosts when they are young and keep parasitizing them through adult age. Within the young group, the specimen counts of *Cylicocyclus* and *Cylicostephanus* genera represented nearly two thirds (64.29%) of the total number; while in the adult group, the *Cylicostephanus* genus contained more than 70% of the cyathostomine nematode burden. These results seem to follow an ample geographic tendency, as pointed out by several authors (FOSTER, 1936, REINMEYER *et al.*, 1984, LOVE e DUNCAN, 1992, SILVA *et al.*, 1995).

Table 1 – Cyathostominae species and immature form average counts, their individual ranges of variation, number of uninfected hosts, prevalence in young and adult group of horses and statistical significance.

Table 2 – Average parasite counts, their individual ranges of variation, number of uninfected hosts, prevalence in young and adult group of horses and statistical significance.

None of the adult equids was infected with *Cylicocyclus ashworthi*, *Cylicocyclus ultrajectinus*, *Cylicocyclus elongatus*, *Cylicocyclus radiatus*, *Cylicodontophorus bicoronatus*, *Cylicostephanus mettami*, *Petrovinema poculatum* and *Poteriostomum imparidentatum*. (Table 1).

In the total of nematode species found in the 14 killed hosts (Table 2), *Trichostrongylus axei* had a low prevalence and small parasitic burden in both groups. In 1981, Pandey *et al.* reported a prevalence of 80.0% of *T. axei* in equine hosts in Morocco.

None of the adult equids used were infected with *Parascaris equorum*, an ascarid. This confirmed Urquhart *et al.* (1990), who reported prevalence of this species as higher in young and low in adults. The counts of this species for each age group were significantly different according to Fischer's Exact Test.

Strongylus vulgaris was restricted to the young group, with a prevalence of 42.9% (average of 110 parasites per host). Several researchers (REINEMEYER, 1986; UHLINGER, 1990, CHAPMAN, 1991,) believe that the "large strongyles", because of modern anthelmintic drugs, cease to be the most important parasitic nematodes of equid hosts. This applies to *Strongylus edentatus* in this study, since the prevalence was 14.28% and 28.57% respectively for the young and adult groups.

The genus *Triodontophorus* was 100% prevalent (average of 12,435 parasites per host) in the young and 14.28% (average of 115 parasites) in the adult groups, which brought the difference between groups concerning the number of infected horses, to be statistically significant by the Fischer's Exact Test.

Oxyuris equi appeared in both groups with prevalences

of 85.71% (average of 1580 parasites) in the young group and 71.42% (average of 200 parasites) in the adult one. All the *O. equi* specimens parasitizing young hosts were mature and those infecting adults were immature ones; this seems to be one of the manners by which age-resistance of hosts against invading organisms manifests itself. This finding is in agreement with previous observations (DRUDGE, 1972).

The cestode, *Anoplocephala perfoliata*, was present in low prevalence (28,57%) in both groups and showed a small parasite burden, being found in only two animals of each group. The difference between groups was not significant though; probably this was due to a sampling deficiency. Reinemeyer *et al.* (1984) link the low prevalence of this cestode species to age-resistance, which would cause adult hosts to have a decreasing propensity to become infected.

The prevalence of *Habronema muscae* was of 85.7% in both groups, but the young ones were nearly 15 times (570 parasites) as infected as the adults (38 parasites).

Craterostomum acuticaudatum was found in only three animals of the adult group (prevalence of 42.85%). Prevalence was too low for a definitive conclusion, since it is improbable that this species is restricted to adult hosts.

Gyalocephalus capitatus, a species whose genus is no more considered part of the group Cyathostominae (HARTWICH, 1986, *apud* LICHTENFELS *et al.*, 1997), presented a higher prevalence in adult horses (71,41%) than in the young horses (28,57%), but it is not probable that the prevalence can be linked to the host's age although these levels do not differ statistically according to Fischer's Exact Test.

Attention is called to the higher percentage rate of female specimens (Figure 2 and 3), often averaging above those of male specimens. It can be observed that the predominance of female specimens was even higher when estimated for the Cyathostominae nematodes found in the young hosts, in which they surpassed 78% of the total counts. This finding corroborates previous assumptions that young hosts do carry a heavier female parasitic burden than the adult horses.

Concerning the forms still in development (immature forms), it was observed that previous assumptions were correct; adult hosts carried a lower cyathostomine burden ($P < 0,01$) than the young ones. While adult hosts were infected with a little more than 2,000 of immature nematode forms, the young hosts carried a burden of above 50,000.

In closing, it can be said that our study adds to a vast bibliographic documentation of worldwide dimension on Cyathostominae in equids. Our research supports the fact that chemotherapeutic advances help suppress and control nematode infection in equid hosts. Despite the valuable contributions of geneticists to select host resistance against nematode infections, the horse and mule breeders of contemporary times are facing the conspicuously growing importance of the Cyathostominae. This group of parasites will need more and more veterinary research, since the small Cyathostominae are certainly the most troublesome parasites of Equidae.

References

- CHAPMAN, M. R.; KLEI, T. R.; FRENCH, D. D. Identification of thiabendazole-resistant cyathostome species in Louisiana. *Vet. Parasitol.*, Amsterdam, v.39, p. 293-299, 1991.
- DRUDGE, J.H.. Metazoal parasites: endoparasitisms. In: CATCOTT, E.J.; SMITHCORS, J.F. (Eds.). *Equine Medicine & Surgery*, 2nd ed. Wheaton: American Veterinary Publications, 1972. p.157-179.
- FOSTER, A. O. A quantitative study of the nematodes from a selected group of equines in Panama. *J. Parasit.*, Lawrence, v.22, p. 479-510, 1936.
- HERD, R.P. Atualização em anti-helmínticos para cavalos. *Hora Vet.*, Porto Alegre, v.11, n. 64, p. 45-49, 1991.
- HERD, R.P. The changing world of worms: the rise of the Cyathostomes and the decline of *Strongylus vulgaris*. *Comp. Contin. Educ. Pract. Vet.*, v. 12, p. 732-736, 1990.
- LANFREDI, R. M. *Estudo dos ciatostomíneos parasitos de cavalos (Equus caballus L. 758), no município de Itaguaí, R J. (Nematoda, Strongylidae, Cyathostominae)*. 1983. 116 f. Tese (Doutorado em Parasitologia Veterinária) – Universidade Federal Rural do Rio de Janeiro, Rio de Janeiro, 1983.
- LICHTENFELS, J. R. Helminths of domestic equids: illustrated keys to genera and species with emphasis on North American forms. *Soc. Washington, Lawrence*, v. 42, p. 1-92, 1975.
- LICHTENFELS, J. R. et al.. An annotated checklist, by genus and species, of 93 species level names for 51 recognized species of small strongyles (Nematoda: Strongyloidea: Cyathostominae) of horses, asses and zebras of the world. South African, WAAVP, 1997. (In press).
- LOVE, S.; DUNCAN, J. L. The development of naturally acquired Cyathostome infection in ponies. *Vet. Parasitol.*, Amsterdam, v. 44, p.127-142, 1992.
- MAIR, T. S. Recurrent diarrhea in aged ponies associated with larval cyatostomiasis. *Equine Vet. J.*, Newmarket, v.25, p.161-163, 1993.
- OGBOURNE, C. P. The prevalence relative abundance and site distribution of nematodes of the subfamily cyathostominae in horses killed in Britain. *J. Helminthol.*, London, v.50, p.203-214. , 1976.
- PANDEY, V. S.; OUHELLI, H.; ELKHALFANE, A. Epidemiological observations on stomach worms of horses in Morocco. *J. Helminthol.*, London, v.55, p.155-160, 1981.
- REINEMEYER, C. R. Small strongyles: recent advances. *Equine.Pract.*, Santa Barbara, v.2, p.281-312, 1986.
- REINEMEYER, C. R. et al.. The prevalence and intensity of internal parasites of the horse in the USA. *Vet. Parasitol.*, Amsterdam, v.15, p.75-83, 1984.
- SAS INSTITUTE. User's Guide: estatistics. Cary, 1989-1996.
- SILVA, A. V. M.; BARBARA, L.; COSTA, H.M.A. Cyathostominae (Nematoda-Strongylida) assinalados em eqüinos de alguns estados brasileiros. In: CONGRESSO BRASILEIRO DE PARASITOLOGIA, 14, 1995, Goiânia. *Resumos...* Goiânia: CBPV, 1995. p. 273
- THEILER, G. The Strongylidae and other nematodes parasitic in the intestinal tract of South African equines. 1923.175 f. Thèse (Neuchâtel) – Faculté des Sciences de L'Universite de Neuchatel, Pretoria, 1923.
- UHLINGER, C. Effects of three anthelmintic schedules on the incidence of colic in horses. *Equine Vet. J.*, New Market, v.22 , p.251-254, 1990.
- URQUHART, G. M. et al. *Parasitologia Veterinária*. Rio de Janeiro: Guanabara, 1990. p.306.