

STUDY OF THE PREVALENCE AND CHARACTERISTICS OF ANATOMO-HISTOPATOLOGICAL LESIONES ASSOCIATED WITH *ANOPLOCEPHALA PERFOLIATA* (GOEZE, 1782) IN ABATED EQUINES FROM A REFRIGERATED SLAUGHTER HOUSE IN APUCARANA – PR

L. A. SANGIONI^{*1}, O. VIDOTTO², B. LUZ. PEREIRA³ & G. L. BONEZI⁴

(1) Departamento de Medicina Veterinária do Centro Integrado de Ensino Superior – CIES – Campo Mourão, PR
Mestrando de Sanidade Animal/CCA/DMVP/Universidade Estadual de Londrina, PR, Brasil

Rua Irmãos Pereira, 670, Centro, Campo Mourão, Paraná – E-mail: sangioni@grupointegrado.br

(2) Parasitologia Veterinária e Doenças Parasitárias/CCA/DMVP/Universidade Estadual de Londrina, PR, Brasil
Campus Universitário – Cx. Postal 6001, Londrina, PR, CEP 86051-990

(3) Doenças Parasitárias/CCA/DMVP/Universidade Estadual de Londrina, PR, Brasil
Campus Universitário – Cx. Postal 6001, Londrina, PR, CEP 86051-990

(4) Ministério da Agricultura – SIF – Inspeção de Produtos de Origem Animal/UNOESTE
Av. Café, 543, Londrina, PR, CEP 86038-000

SUMMARY: The prevalence of *Anoplocephala perfoliata* was evaluated in 310 horses slaughtered in a processing plant in Apucarana county, Paraná state, Brazil, from January to December 1998. The annual prevalence was 21.2% and the distribution of the infected animals based on the level of parasitism was: 58% mild (less than 20 parasites), 27% moderate (21-100 parasites) and 15% high (over 100 parasites). Higher levels of parasitism occurred in February (32%), April (42.3%) and December (36.3%). Macro and microscopic lesions associated with the parasitism were: mucosal erosion, ulcerations, edema with eosinophilic and mononuclear infiltration of the mucosa and basal membrane of the cecum and colon.

KEY WORDS: Cestode infection, *Anoplocephala perfoliata*, horses, parasitism anatomico-histopatological injuries

INTRODUCTION

Helmintoses of equines and their associated complications diminish the production and the performance of the livestock, causing irreversible economic losses. Amongst the diverse helminthes, *Anoplocephala perfoliata* is the cestode most frequently found in equines (URQUHART, 1996).

The infection of equines with these parasites was considered insignificant for many years (FRENCH *et alii*, 1994) and its etiology still remains controversial as causal of severe pathology (PROUDMAN *et alii*, 1993).

However the cestodes (*Anoplocephala magna*, *Anoplocephala perfoliata* and *Paranoplocephala mamillana*), are agents of gastrointestinal disturbances (PROUDMAN *et alii*, 1998). Some of the causes of the gastrointestinal distress, such as: intussusception, twisting, blockage and ruptures, have been attributed to these parasites, when pathological detriment is found in conjunction with large numbers of parasites at the site of infection. The large number of cestodes at the site of

the parasitism contributes to the exacerbation of the injuries and establishes the degree of the pathological damage to the tissue (FOGARTY *et alii*, 1994; TRAUB – DARGATZ *et alii*, 1994). The main anatomical-histopatological trauma found varied from superficial congestion until slight elevation and focal ulceration. The inflammatory reactions extend beyond the areas of injury (PEARSON *et alii*, 1993).

The prevalence of cestodes in equines varies from 20% to 81.5% in some geographic regions of the world (Table 3). LYONS *et alii*, (1986) demonstrated through autopsies a 30% and 60% prevalence of *perfoliata* in the cecum of ponies, and adults respectively. BAIN and KELLY, (1977) had found a prevalence of 81.5% of equines inflicted with *A. perfoliata* of which, 63.1% exhibited extensive ulceration in the ileocecal junction and surrounding regions.

TOLLIVER *et alii*, (1985) had not found the presence of the parasites in the gastrointestinal tracts of mares, despite the small sampling used in the experiment, also RICCI and SABATINI, (1992) had found a discrete prevalence in donkey and mule.

The objective of this work was to determine the prevalence of infestation of cestodes in equines, abated in a refrigerated slaughter house, by *post mortem* examination, and to observe the anatomo-histopatological injuries associated with the site of the parasitism.

MATERIALS AND METHODS

Animals and Sampling

The collection of the samples took place in the refrigerated slaughter house of Apucarana, in the state of the Paraná, where it processes abated horses. The experiment was carried out through January to December of 1998. The establishment processes on average 2500 animals per month and the experimental sample consisted of 310 intestinal tracts, calculated by the technique of probabilistic sampling of finite populations, COCHRAN (1977). The animals originated from the states of São Paulo, South Mato Grosso, Paraná and Santa Catarina. All the abated equines had been inspected before death, as is the normal practice of the Federal Inspection Service (FIS). 20 to 30 samples were inspected each month, selected biweekly on random days of the week.

Inspection of Intestinal Samples

The intestinal samples had been inspected in the line of abate, where the anatomical parts were casually selected, 15 minutes after the slaughter, the samples were washed in tap-water and placed dorsal region down with the ventral region exposed. An incision was made in the thin intestine in the distal position of the ileum, approximately 50 cm from the ileo-cecal valve, in the ileo-cecal valve and cecum and colon bigger than 100 cm of the ceco-cólica valve according to the technique proposed by GREINER *et alii*, 1994.

Soon after, the fecal content not adherent to the wall was inspected and the region was removed, collecting all the units of joined cestodes. Then systematic counting and classification of the cestodes was performed, according to the described morphologic descriptions of LICHTENFELS, 1975; FREITAS, 1980. The intestinal mucosa was inspected and the observed anatomo-pathological conditions were recorded.

To determine the degree of parasitism, the criteria established by FOGARTY *et alii*, 1994 was followed: up to 20 parasites, 21 to 100 parasites and more than 100 parasites. In the cestode site a sample was taken of sections of intestine, approximately 5 cm square and was subjected to the anatomo-histopatological exam.

Anatomo-histopatological Examinations

The samples were examined in the laboratory of Pathological Anatomy of the State University of Londrina, Department of Preventive Veterinary Medicine. The procedure involved fixation in 10% formalin buffer, then the samples were processed in paraffin and sectioned by microtomy to yield 3mm slices, which were then stained in Hematoxilina-Eosina and examined through a microscope.

Statistical Analysis

The chi-square test was used to evaluate the significant differences between the months relative to the number of positive animals.

RESULTS AND DISCUSSION

The prevalence and the monthly distribution of *A. perfoliata* are presented in Tables 1 and 2. *Anoplocephala magna* and *Paranoplocephala mamillana* were not found, which is comparable to the results obtained by BAIN and KELLY, 1977; LYONS *et alii*, (1983) and MFITILODZE and HUTCHINSON, 1989. The evaluations of the prevalence of these parasites in different countries and different circumstances, showing the most varied indices of infected animals are shown in Table 3.

The breed, fur-condition, sex and the age had not been recorded, thus it was not possible to evaluate these data in the line of abatement. The refrigerated slaughter house receives animals from cities throughout Brazil, but the majority of the animals originate from the states of São Paulo, South Mato Grosso, Paraná and Santa Catarina, with the predominant supplier being Paraná. The great majority of abated animals are commercialized by intermediates who group them into lots which do not represent the real origin of the animals.

In this experiment, there was observed a low prevalence of the *A. perfoliata* when compared to BAIN and KELLY, 1977; LYONS *et alii*, 1983; FOGARTY *et alii*, 1994; BENTON and LYONS, 1994; NILSSON *et alii*, 1995; NILSSON *et alii*, 1995; CABRAL *et alii*, 1997. The observed prevalence was similar to that found by IHLER *et alii*, (1995); and REINEMEYER *et alii*, 1984. A higher prevalence when compared with GAWOR, 1995 was observed in this study. The sampling technique of this study was different to the one employed in the latter study, which may explain the discrepant values. However, CABRAL *et alii*, (1997) reports base indices of the parasite in the state of the Paraná, and is compatible with the data obtained here. As stated by DENEGRÍ, 1993 the differences of the microhabitat, type of pasture, climatic conditions and access of the equines to the pastures, had contributed to the variation of the prevalences between the different studies and determine the growth of the populations of mites, favoring the availability of these hosts in the environment, (IHLER *et alii*, 1995). The differences in the type of soil and conditions of acidity also

Table 1 – Prevalence of *Anoplocephala perfoliata*, in equines abated in a refrigerated slaughter-house in Apucarana – PR, from the period January to December of 1998.

Animal Groups	Number of Animals Examined	
	Nº	%
Animals not parasitized	244	78.8
Parasitized animals	66	21.2
Total	310	100

Table 2 – Monthly distribution of equines infected with *Anoplocephala perfoliata* in a refrigerated slaughter-house in Apucarana – PR, from January to December of 1998.

ANIMALS	MONTHS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Positives	4* (16)**	8 (32)	2 (10)	11 (42.3)	8 (28.6)	4 (14.3)	4 (16.7)	3 (11.6)	3 (12)	5 (20.9)	2 (7.6)	12 (36,3)
Total	25	25	20	26	28	28	24	26	25	24	26	33

*Number of animals

**Percentage

 $\chi^2 = 22.262$

P = 0.0200

can contribute to the variation of prevalences between the different authors, thus needing specific studies of the biology of the mite in the state of the Paraná, to further clarify the occurrences.

LYONS *et alii*, 1983; BENTON and LYONS, 1994 and MFITILODZE and HUTCHINSON, 1989, carried out studies in necropsied animals that differed from the methodology used in this work.

The percentage of monthly occurrences of this parasitism was greatest in the month of April (42.3%) and the least was in November (7.6%) (Table 2). There was a significant difference among the months relative to the number of positive animals ($P < 0.05$). These data are compatible with those found by CABRAL *et alii*, 1997 and different from the findings of MFITILODZE and HUTCHINSON, 1989; LYONS *et alii*

1983; BENTON and LYONS 1994, which is attributed to the geographic, climatic differences and handling adopted with the pastures and the animals. One notices therefore, that the period for the development of the cisticercoide larva is approximately 2 to 4 months, then the period of infection of the intermediate hosts probably occurs in the summer when the oribatideo mites had found favorable climatic conditions for proliferation, and the low indices in November, may be attributed to the unfavorable ambient conditions, implying a low availability of intermediate hosts. The distribution of the degree of infections of the parasite was similar to that found by FOGARTY *et alii*, 1994 (Table 4). Few animals met with high parasitic loads (3.2%). The predilection of the localization of these parasites was in the ileo-cecal valve. The great majority (18.1%) exhibited a moderate parasitic load (up to 100 parasites).

Table 3 – World-wide pravalence of *Anoplocephala perfoliata* in equines.

Country	Author	Animal Category	Sample Size	Method Utilized	Frequency (%)
Australia	WILLIAMSON <i>et alii</i> , 1997	Equines	130	Necropsy	38.5
Australia	BAIN e KELLY	Equines	65	<i>Post Mortem</i> Exam in slaughter-house	81.5
Brazil	GOMES <i>et alii</i> , 1997	Equines	1090	<i>Post Mortem</i> Exam in slaughter-house	42
Brazil	CABRAL <i>et alii</i> , 1997	Equines	1689	<i>Post Mortem</i> Exam in slaughter-house	32.5
Ireland	FOGARTY <i>et alii</i> , 1994	Equines	363	<i>Post Mortem</i> Exam in refrigerated slaughter-house	50.7
England	MFITILODZE e HUTCHINSON, 1989	Equines	57	Necropsy	32
Norway	IHLER <i>et alii</i> , 1995	Equines	201	<i>Post Mortem</i> Exam in refrigerated slaughter-house and Necropsy	20
Poland	GAWOR, 1995	Equines	50	Necropsy	4
Sweden	NILSSON <i>et alii</i> , 1995	Equines	470	<i>Post Mortem</i> Exam in slaughter-house	65
USA	LYONS <i>et alii</i> , 1983	Equines	363	Necropsy	54
USA	REINEMEYER <i>et alii</i> , 1984	Equines	55	Necropsy	18
USA	TOLLIVER <i>et alii</i> , 1985	Asses	8	Necropsy	0
USA	BENTON e LYONS, 1994	Equines	118	Necropsy	60

Table 4 – Distribution of the number of equines abated in a refrigerated slaughter-house in Apucarana – PR, infected with *Anoplocephala perfoliata*, examined *post mortem*, according to degree of infection, from January to December of 1998.

DEGREE OF INFECTION	MONTHS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
absence of parasites	21* (84)**	17 (68)	18 (90)	15 (57.7)	20 (71.4)	24 (85.7)	20 (83.3)	23 (88.4)	22 (88)	19 (79.1)	24 (92.4)	21 (63.7)
less than 20 parasites	1 (4)	4 (16)	0	9 (34.7)	4 (14.2)	3 (10.8)	4 (16.7)	3 (11.6)	2 (8)	3 (12.5)	1 (3.8)	4 (12.1)
from 21 to 100 parasites	2 (8)	3 (12)	2 (10)	1 (3.8)	2 (7.2)	0	0	0	0	1 (4.2)	0	7 (21.2)
more than 100 parasites	1 (4)	1 (4)	0	1 (3.8)	2 (7.2)	1 (3.5)	0	0	1 (4)	1 (4.2)	1 (3.8)	1 (3)
Total	25	25	20	26	28	28	24	26	25	24	26	33

*Number of animals

**Percentage

The predominant anatomo-histopatological alterations encountered were: ulcerating lesions, focal congestion and edema, mononuclear and eosinophil infiltrations in the mucosa and basal membrane, and edema of lymphatic vessels. The inflammatory injuries were extended beyond the focal area, as was documented by PEARSON *et alii*, 1993; WILLIAMSON *et alii*, 1999. In this study, an anatomo-histopatological alteration observed was the presence of few species settled in the mucosa, contributing to local intestinal blockage, also documented by IHLER *et alii*, 1995.

The degree of infection and the severity of the injuries are intimately associated, although there may exist no history of dysfunction of the gastrointestinal tracts, it still weighs heavily on the corporal conditions of an afflicted animal. In the ileo-cecal valve of a severely parasitized animal, there exhibited acute edema obstructing the passage through the intestinal tract.

The relation between cestode infection and intestinal dysfunction presently remains controversial, consequently specific measures of control as effective treatments and antiparasitic programs are necessary, as well as the adequate handling of pastures to control the intermediate host. More recent serological techniques are indicated for more consistent epidemiological studies.

SUMÁRIO

O estudo avaliou a prevalência de *Anoplocephala perfoliata* em 310 equinos abatidos no matadouro frigorífico de Apucarana – PR entre os meses de janeiro a dezembro de 1998. A prevalência anual encontrada foi de 21,2% sendo atribuído o grau de infecção em animais com até 20 parasitas (58%), de 21 a 100 parasitas (27%) e mais de 100 parasitas (15%). Os maiores índices de parasitismo observaram-se nos meses de fevereiro (32%), abril (42,3%) e dezembro (36,3%). As principais alterações anatomo-

histopatológicas encontradas foram: alterações erosivas, ulcerações, edemas, e infiltrações de eosinófilos e mononucleares de mucosa e lâmina própria de ceco e cólon.

PALAVRAS-CHAVES: Cestoda infecção, *Anoplocephala perfoliata*, equino, lesões anatomo-histopatológica.

REFERENCES

- BAIN, S.A.; KELLY, D.J. 1977. Prevalence and pathogenicity of *Anoplocephala perfoliata* in a horse population in South Auckland. *New Zeland Veterinary Journal*, n 25, p 27-28.
- BARCLAY, P.W.; PHILIPS, N.T.; FOERNER, J.J. 1982. Intussusception associated with *Anoplocephala perfoliata* infection in five horses *Journal of American Veterinary Medical Association*, v 180, n 7, p 752-753.
- BENTON, R.E.; LYONS, E.T. 1994. Survey in central Kentucky for prevalence of *Anoplocephala perfoliata* in horses at necropsy in 1992. *Veterinary Parasitology*, n 55, p 81-86.
- CABRAL, D.D.; TUNALA, V.; LEOPOLDINO, M.L. 1997. Estudo da ocorrência de *Anoplocephala perfoliata* (GOEZE, 1782) em equídeos abatidos no frigorífico Pomar em Araguari, MG, Brasil. *Notícias Veterinárias*, v 3, n 1, p 79-82.
- COCHRAN, W.C. 1977. *Sample techniques*. 3 ed. New York: John Willey, Cap. 4: the estimation of sample size, p 93-97.
- DENEGRI, M.G. 1993. Review of oribatid mites as intermediate hosts of tapeworms of Anoplocephalidae. *Experimental & Applied Acarology*, v 17, p 567-580.
- FOGARTY, U.; DEL PIERO, F.; PURNELL, R.E.; MOSURSKI, K.R. 1994. Incidence of *Anoplocephala perfoliata* in horses examined at an Irish abattoir. *Veterinary Record*, v 34, p 515-518.
- FREITAS, G.M. 1980. *Helminthologia Veterinária*, 4ª ed., Rabelo, Belo Horizonte.
- FRENCH, D.D.; CHAPMAN, M.R.; KLEI, T.R. 1994. Effects of treatment with ivermectin for five years on the prevalence

- of *Anoplocephala perfoliata* in three Louisiana pony herds. *Veterinary Record*, n 135, p 63-65.
- GAWOR, J.J. 1995. The prevalence and abundance of internal parasites in working horses autopsied in Poland. *Veterinary Parasitology*, n 58, p 99-108.
- GOMES, T.L.S.; HUSSNE, M.; TUNALA, V.; TAMURA, E.Y. *et alii*. 1997. Pesquisa sobre a incidência de tênias em equídeos. *A Hora Veterinária*, n 95, p 11-12.
- GREINER, E.C.; LANE, T.J. 1994. Effects of the daily feeding of pyrantel tartrate on *Anoplocephala perfoliata* infection in three horses: A pilot Stud. *Journal of Equine Science*, v 14, n 1, p 43-44.
- IHLER, C.F.; ROOTWELT, V.; HEYERAAS, A.; DOLVIK, N.J. 1995. The prevalence and epidemiology of *Anoplocephala perfoliata* infection in Norway. *Veterinary Research Communication*, v 19, p 487-494.
- LICHTENFELS, J.R. 1975. Cestoda parasitic in domestic equids. *Proceedings of Helminthological Society of Washington*, v 42, p 71-73.
- LYONS, E.T.; TOLLIVER, S.C.; DRUDGE, J.H.; SWERZEK, T.W.; *et alii*. 1983. Parasites in Kentucky Thoroughbreds at necropsy: Emphasis on stomach worms and tapeworms. *American Journal Veterinary Research*, v 44, n 5, p 839-844.
- LYONS, E.T.; DRUDGE, J.H.; TOLLIVER, S.C.; SWERZEK, T.W. *et alii*. 1986. Pirantel pamoato: Evaluating its activity against equine tapeworms. *Veterinary Medicine*, v 3, p 280-285.
- LYONS, E.T.; TOLLIVER, S.C.; SWERZEK, T.W.; DRUDGE, J.H.; *et alii*. 1987. Common internal parasites found in the stomach, large intestine and cranial mesentery artery of thoroughbreds in Kentucky at necropsy (1985 to 1986). *American Journal Veterinary Research*, v 45, n 2, p 268-273.
- MFITILODZE, M.W.; HUTCHINSON, G.W. 1989. Prevalence and intensity of non-strongyle intestinal parasites of horses in northern Queensland. *Australian Veterinary Journal*, v 66, n 1, p 23-26.
- NILSSON, O.; LJUNGSTRÖM, B.L.; HÖGLUND, J.; LUNDQUIST, H. *et alii*. 1995. *Anoplocephala perfoliata* in horses in Sweden: Prevalence, infection levels and intestinal lesions. *Acta Veterinaria Scandinavica*, v 36, p 319-328.
- PEARSON, G.R.; DAVIGS, L.W.; WHITE, A.L.; O'BRIEN, J.K. 1993. Patological lesions associated with *Anoplocephala perfoliata* at the ileo-cecal junction of horses. *Veterinary Record*, n 132, p 179-182.
- PROUDMAN, J.C.; EDWARDS, G.B. 1993. Are tapeworms associated with equine colic? A case control study. *Equine Veterinary Journal*, v 25, n 3, p 224-226.
- PROUDMAN, J.C.; FRENCH, N.P.; TREES, A.J. 1998. Tapeworm infection is a significant risk for spasmodic colic and ileal impaction colic in the horse. *Equine Veterinary Journal*, v 30, n 3, p 194-199.
- REINEMEYER, C.R.; SMITH, S.A.; GABRIEL, A.A.; HERD, R.P. 1984. The prevalence and intensity of internal parasites of horses in the USA. *Veterinary Parasitology*, n 15, p 75-83.
- RICCI, M.; SABATINI, A. 1992. Notizie sugli elminti parassiti del cieco e del colon degli equidi in Italia. *Parassitologia*, v 34, p 53-60.
- TRAUB-DARGATZ, U.L.; SCHLIPE, J.W.; VAP, L.; EHRART, J.E. 1994. Challenging cases in internal medicine: What's your diagnosis? *Veterinary Medicine*, p 100-104.
- TOLLIVER, S.C.; LYON, E.T.; DRUDGE, J.H. 1985. Species of small strongyles and other internal parasites recovered from donkeys at necropsy in Kentucky. *Proceedings Helminthological Society of Washington* v 52, n 2, p 260-265.
- WILLIAMSON, R.M.C.; GASSER, R.B.; MIDDLETON, D.; BEVERIDGE, I. 1997. The distribution of the horse and associated pathological changes. *Veterinary Parasitology*, n 73, p 225-241.