

ARTÍCULO ORIGINAL

Presence of Gasterophilus (Leach, 1817) (Diptera: Oestridae) in horses in Rio Grande do Sul State, Brazil

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ABSTRACT

With the purpose of verify the presence of larvae from the genus *Gasterophilus* in the Rio Grande do Sul State, a study was undertaken using 395 horses taken to slaughter in the city of Pelotas. The material analysis revealed that 126 animals (31,90%) presented infection, with 100 animals (25,32%) infected by *Gasterophilus nasalis*, and 47 animals (11,90%) infected by *G. intestinalis*. These results also represent the first report of the definite establishment of *G. intestinalis* as a horse parasite in Brazil. The probable implications of *G. intestinalis* occurrence in Brazil are discussed.

Key words: *Gasterophilus*; *G. nasalis*; *G. intestinalis*.

INTRODUCTION

The genus *Gasterophilus* (Diptera, Oestridae) includes eight species of flies whose larvae cause gastrointestinal myiasis in equids¹. In Brazil *Gasterophilus intestinalis* De Geer, 1776² and *Gasterophilus nasalis* Linnaeus 1758³ were the two species described until now.

The myiasis develops for a period of 10 to 12 months in different regions of the equine digestive tract⁴. *G. nasalis* larvae of second and third instar (L2 and L3) are found in the pylorus and first portion of the duodenum, immediately after the pyloric sphincter⁵, whereas L2 and L3 larvae from *G. intestinalis* are usually found in the non-glandular portion of the stomach.

Generally, gasterophilosis manifests with dysphagia, gastric and intestinal ulceration, gastric obstruction or volvulus, rectal prolapse, anemia,

diarrhea, and other digestive problems⁶.

Apart from the losses caused to equids, there are reports of infections caused by gasterophilids in dogs, pigs, birds⁷ and human beings⁸.

Studies on the occurrence and prevalence of the genus *Gasterophilus* undertaken in Brazil suggest just the presence of *G. Nasalis*⁹⁻¹⁵. The occurrence of *G. intestinalis* has been reported, in isolated cases of imported animals^{2,16}, and therefore the species is not yet considered as established in Brazil¹⁴.

The updating of the general occurrence and seasonal occurrence of the genus *Gasterophilus* in Brazil is important, not only to help the clinical diagnosis and control planning of gasterophilosis, but also from a biological and ecological point of view¹.

This study reports the occurrence of gasterophilids in horses slaughtered at a slaughterhouse in Rio Grande do Sul State, and

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indicates the establishment of *G. intestinalis* in Brazil.

MATERIAL AND METHODS

The stomachs of 395 horses were analyzed after slaughter at a commercial slaughterhouse in the city of Pelotas, Rio Grande do Sul. The studied horses were from different regions of the State. The city of origin and the sex of each animal were registered, but no specification was made as to breed or age.

After the evisceration, the animals' stomachs were opened on the greater curvature, from the cardia to the pylorus, together with the first portion of the duodenum; these were examined in search for the larval forms of *Gasterophilus* spp. When found, the point of fixation (cardia, non-glandular region, glandular region, pilorum-duodenum) was registered and the sample was collected and stored individually. These samples were taken immediately to the laboratory, where they were weighed and identified by appropriate keys⁴ (Figure 1).

RESULTS

The findings on the slaughtered animals are

presented in Table 1. A hundred and twenty six (31,90%) out of 395 animals were infected by *Gasterophilus* sp. larvae. Of the overall animals infected, males were more parasitised than females, both in relation to the total of males (34,57%) as well as the total of positive animals (66,66%).

The infection by species and region (mesoregion, Figure 2) of the Rio Grande do Sul State is presented in Table 2. Findings showed 100 (77,34%) horses infected by *G. nasalis* and 47 (48,44%) horses infected by *G. intestinalis*. Of the animals presenting the disease, 107 (83,59%) were suffering the infection of only one species, and 21 (16,41%) presented larvae of both species.

A total of 1.451 larvae of second and third instars was collected, with a mean of 10,97 larvae per animal. Of the total larvae found, 760 (52,38%) were of *G. nasalis* and 691 (47,62%), of *G. intestinalis*.

Horses infected by gasterophilids were found in all the mesoregions of the State of Rio Grande do Sul (Table 3). The infection of horses by *G. nasalis* was identified in 24 municipalities, and the infection by *G. intestinalis* was found in 19 municipalities.

The necropsy of the animals revealed that

Table 1. Number and percentage of horses with gasterophilosis according to sex

Horses	PG ¹	(%)	NG ²	(%)	Total
Male	84	34.57	159	65.43	243
Female	42	27.63	110	72.37	152
Total	126	31.90	269	68.10	395

1- PG: Positive for gasterophilosis; 2- NG: Negative for gasterophilosis.

Table 2. Regional distribution of the number and percentage of gasterophilids found in horse slaughtered in Rio Grande do Sul

Region	Gn ²	(%)	Gi ³	(%)	1 sp ⁴ .	(%)	2 sp.	(%)
Northeast	3	15.79	0	0.00	3	15.79	0	0.00
Metropolitan	7	24.14	4	13.79	9	31.03	1	3.45
Central ¹	12	27.27	2	4.55	12	27.27	1	2.27
Southeast	40	28.78	17	12.23	43	30.94	7	5.04
Southwest	29	22.48	19	14.73	26	20.16	11	8.53
Northwest	9	25.71	5	14.29	12	34.29	1	2.86
Total	100	25.32	47	11.90	105	26.58	21	5.32

1- Mid Occidental & Mid Oriental; 2- Gn: *Gasterophilus nasalis*; 3- Gi: *Gasterophilus intestinalis*; 4- sp.: species.

Table 3. Regional distribution of the number and percentage of gasterophilosis positive horses from a slaughterhouse in Rio Grande do Sul

Region	Horses	PG ²	(%)	NG ³	(%)
Northeast	19	3	15.79	16	84.21
Metropolitan	29	10	34.48	19	65.52
Central ¹	44	13	29.55	31	70.45
Southeast	139	50	35.97	89	64.03
Southwest	129	37	28.68	92	71.32
Northwest	35	13	37.14	22	62.86
Total	395	126	31.90	269	68.10

1- Mid Occidental & Mid Oriental; 2- PG: Positive for gasterophilosis; 3- NG: Negative for gasterophilosis.

most were infected with up to 20 larvae (table 4). Of the 100 animals infected by *G. nasalis*, 1 presented larvae in the stomach, and from the 47 presenting *G. intestinalis*, none presented larvae in the duodenum. In all the other animals the two species of gasterophilids were found on their usual anatomic fixation sites.

DISCUSSION

The results of this study show that, *G. nasalis* is not the only species of the *Gasterophilus* genus acclimatised in Brazil. Differing from former studies^{9,10,13-15} this work shows that *G. intestinalis* has definitely established in Brazil. This was confirmed by the presence of the parasite in different municipalities of the whole state, and in Rio Grande do Sul born horses.

The great prevalence of the infection by *G. nasalis* both in relation to the *G. intestinalis*, as well as the number of infected animals and the

Table 4. Number and percentage of gasterophilids found per horse

Gasterophilids/ Infestation	Horses	
	n	(%)
From 1 to 20	102	80.95
From 20 to 50	17	13.49
From 50 to 100	6	4.76
> than 100	1	0.79
Total	126	100.00

number of collected larvae, can indicate a process of adaptation of the later species. In Italy it was found a predominance of *G. intestinalis* (95,2%) over *G. nasalis* (44,8%)¹. These results were similar to the ones previously found in the State of Victoria, southeast Australia¹⁷, where the infections were 81% by *G. intestinalis* and 29%



Figure 1. *Gasterophilus nasalis* (left) and *Gasterophilus intestinalis* (right) recovered from horses in Rio Grande do Sul.



Figure 2. Mesoregions of the Rio Grande do Sul State, Brazil.

by *G. nasalis*. The predominance of *G. intestinalis*, can be related to the preference of this parasite for the stomach, favouring its access to food, and increasing its biotic potential¹.

Gasterophilus intestinalis has a worldwide distribution, with a greater number of reports in temperate regions of central Europe, and south-southeast United States, and increasing in periods of lower temperatures in Europe¹, Australia¹⁷ and Jordan¹⁸.

The climatic situation of the State of Victoria, in Australia, is similar to that of Rio Grande do Sul, with humid winters and temperatures lower than the national average, period of increased *G. intestinalis* occurrence¹⁷. In Chile the first evidences of *G. intestinalis* was registered in the VIII region (Biobio)¹⁹, by the identification of eggs of this parasite in the hairs around the horses' mouth, and that the occurrence of this species is grater in winter. Thus, considering the biological and geographic aspects commented above, *G. intestinalis* has potential to become the most prevalent species of the genus in Rio Grande do Sul, and move on to the other states, especially those that have an annual mean temperature lower than Brazilian's one.

Apart from the difference in the prevalence of both species, the parasitism by *G. intestinalis* is worrisome from the clinical point of view, as there are many reports of severe digestive complications caused by this parasite²⁰⁻²².

Further studies are being conducted to describe the ecology of these parasites, and monitor their occurrence in other Brazilian states or South American countries. However, the authors suggest that immediate preventive measures be taken to control the advance of the introduced species in Brazil.

RESUMO

Com o objetivo de verificar a presença de larvas do gênero *Gasterophilus* no Estado do Rio Grande do Sul, foi realizado um estudo com 395 equinos sacrificados em um abatedouro da cidade de Pelotas. O material analisado revelou que 126 animais (31,90%) apresentaram a infecção, sendo que 100 animais (25,32%) estavam infectados por *Gasterophilus nasalis* e 47 (11,90%) por *G. intestinalis*. Estes resultados também representam o primeiro relato definitivo de estabelecimento de *G. intestinalis* como parasito de equinos no

Brasil. As implicações prováveis da presença de *G. intestinalis* no Brasil são discutidas.

REFERENCES

- 1.- OTRANTO D, MILILLO P, CAPELLI G, COLWELL DD. Species composition of *Gasterophilus* spp. (Diptera, Oestridae) causing equine gastric myiasis in southern Italy: Parasite biodiversity and risks for extinction. *Vet Parasitol* 2005; 133: 111-8.
- 2.- LUTZ A. Contribuição ao estudo dos Oestrideos brasileiros. *Mem. Inst Oswaldo Cruz* 1917; 9: 94-112.
- 3.- IHERING R V. Os Oestrideos importados, seu papel como parasitas e em particular os *Gasterophilus* no Brasil. Secretaria da Agricultura, Indústria e Comércio do Estado de São Paulo 1930, 23 p.
- 4.- ZUMPT F. Myiasis in Man and Animals in the Old World. Butterworths, London, 1965.
- 5.- COGLEY T P, COGLEY M C. Inter-relationship between *Gasterophilus* larvae and the horse's gastric and duodenal wall with special reference to penetration. *Vet Parasitol* 1999; 86: 127-42.
- 6.- SOULSBY E J L. Helminths, arthropods and protozoa of domesticated animals, 7th ed. Baillière, Tindall&Cassell, Eastbourne, United Kingdom, 1982.
- 7.- HALL M J R, WALL R. Myiasis of humans and domestic animals. *Adv Parasitol* 1995; 35: 257-334.
- 8.- ROYCE L A, ROSSIGNOL P A, KUBITZ M L, BURTON FR. Recovery of a second instar *Gasterophilus* larva in a human infant: a case report. *Am J Trop Med Hyg* 1999; 60: 403-4.
- 9.- OLIVEIRA C M, RASSIER D S S, LIGNON G B. Gasterofilose equina no Rio Grande do Sul (Brazil). *Rev Med Vet S Paulo* 1972; 8: 61-6.
- 10.- LIGNON G B, RASSIER D S S, OLIVEIRA C M. Prevalência dos estágios evolutivos L₂ e L₃ do *Gasterophilus nasalis* no Rio Grande do Sul. *Arq Fac Vet UFRGS* 1975; 3: 49-56.
- 11.- CODA M L, WATANABE S, IWANAGA E, et al. Prevalência de *Gasterophilus nasalis* L. 1761 em equídeos abatidos na região norte do Estado do Paraná. *Anais do XVIII Congresso Brasileiro de Medicina Veterinária*. Camburiú, SC. Resumo 135, p.175, 1982.
- 12.- MUNDIM M J S, CABRAL D D, TUNALA V. Distribuição geográfica e frequência de gasterofilose em equídeos abatidos em Araguari, minas Gerais. *Braz J Vet Res Anim Sci* 1992; 29: 211-3.
- 13.- KLEM M A P, RODRIGUES A C, REZENDE A M L. Gasterofilose em Equídeos: Infecção Natural por *Gasterophilus nasalis* L. (DIPTERA: GASTROPHILIDAE) no Estado do Rio de Janeiro. *Braz J Vet Med* 1997; 6: 61-7.
- 14.- RODRIGUES A C, REZENDE A M L, NOBILING R A, et al. Estudo da Flutuação de Larvas de 3º instar de *Gasterophilus nasalis* (Linnaeus, 1758) (Diptera: Gasterophilidae) na Microrregião Fluminense do Grande Rio, RJ. *Braz J Vet Med* 1999; 21: 215-8.
- 15.- SEQUEIRA JL, TOSTES R A, OLIVEIRA-SEQUEIRA T C. Prevalence and macro- and microscopic lesions produced by *Gasterophilus nasalis* (Diptera: Oestridae) in the Botucatu Region, SP, Brazil. *Vet Parasitol* 2001; 102: 261-6.

- 16.- GUIMARAES L M, ARAUJO T L, GOMES C E S. Sobre a presença de *Gasterophilus intestinalis* (De Geer, 1776) em equinos PSC no Estado de São Paulo. Vet Fac Med Vet S Paulo 1954; 5: 189-93.
- 17.- BUCKNELL D G, GASSER R B, BEVERIDGE J. The prevalence and epidemiology of gastrointestinal parasites of horses in Victoria, Aust. Int J Parasitol 1995; 25: 711-24.
- 18.- MUKBEL R, TORGERSON PR, ABO-SHEHADA M. Seasonal variations in the abundance of *Gasterophilus* spp. larvae in donkeys in northern Jordan. Trop Anim Health Prod 2001; 33: 501-9.
- 19.- SIVERS G, WEBER B. Período de oviposición de *Gasterophilus nasalis* y *G. intestinalis* en equinos. VIII Región, Chile. Arch Med Vet 2005; 37: 169-72.
- 20.- ROONEY J R. Gastric ulceration in foals. Path Vet 1964; 1: 497-503.
- 21.- DRUDGE J H. Internal Parasites of Horses. American Hoechst Corporation, Somerville, NJ, 17 pp, 1980.
- 22.- DART A J, HUTCHINS D R, BEGG A P. Suppurative splenitis and peritonitis in a horse after gastric ulceration caused by larvae of *Gasterophilus intestinalis*. Aust Vet J 1987; 64: 155-8.

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