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A study on warble infestation in horses from eastern Poland

Badania nad występowaniem gżawicy u koni z rejonów Polski Wschodniej

Summary. Parasites still remain a serious challenge in horse breeding as they not only endanger animal health but pose a threat to its life as well.

Out of the parasitic infections, warble infestation deserves a discussion as this group of parasitic skin conditions is subclinical in its detriment and most frequently and adversely affects the development of a juvenile horse. This fact is related to the mechanism of parasite life cycle which induces extensive tissue damage during its development stage.

The present study revealed an increased *Gasterophilus* sp. warble fly burden in horse stomachs, from 20.4% in the first 10 days of June up to 25.8% in the third 10 days' period of this month. In I study period, male horses were shown to be affected by the invasion more often (24.16%), while in II period – females (33.3%).

The highest invasion extensivity was determined in II study period in horses aged 2–3 years (37.93%), whereas the least affected group appeared to be animals at 2–5 year of age examined in the first 10 days of June.

Key words: horse, warble, *Gasterophilus* sp.

INTRODUCTION

Besides some dangerous infectious and contagious bacterial and viral infections, horses are also prone to parasitic invasions. The disorders are usually asymptomatic and the manifestation of clinical symptoms is rarely associated with specific signs. The most common equine parasites include ascarids, tapeworms, large and small strongyles, warbles, itch mites, ticks, pinworms, lice and Mallophaga. Owing to the subclinical form of the disease and clinical causes reported in horses, warble infestations need a special concern.

The present study aims at determination of the effect of animal sex and age on equine gasterophilosis occurrence.

MATERIAL AND METHODS

The investigations were conducted in two research series throughout June 2006, i.e. I in the first 10 days and II in the third 10 days' period of this month.

The slaughter material obtained from 414 crossbred horses of different sex and age from 6 months – 25 yr was analyzed.

Horses came from the central and eastern part of Poland. Before slaughter, the animals showed no clinical signs of any disease.

On post mortem, the mucosa of stomachs was evaluated towards the presence of larvae of horse warble flies, *Gasterophilus* sp. The analysis was performed in the following five age groups: I – up to 11 months, II – 1–2 yr, III – 2–5 yr, IV – 6–10 yr, V – >10 yr. The aforementioned assignment included the groups determined by the sex factor.

RESULTS

To analyze warble invasion prevalence, the studies were performed in two 10 days' periods of June. The investigations were carried out in relation to horse age and sex groups.

In the first 10 days of June, the age group of horses < 11 months, i.e. 50 animals – 50% of foals of each sex were studied (Tab. 1). The research showed that 24% horses of both sexes harbored the larvae of *Gasterophilus* sp. warble fly in the stomachs. In the third 10 days' period of June, 32 horses from the analogical age group were examined and referring to the earlier studies, the number of infected males appeared to be threefold lower (6.2%) than females (18.75%) (Tab. 1).

The studies of horses aged 1–2 years included 76 animals in I research period and 58 in II one (Tab. 1, 2). The results obtained in the first 10 days of June indicated that the affected males made up 36.8% of their sex group. The percentage of females from this age group with a burden of warble fly larvae was smaller and amounted to 5.3%. On the other hand in II study period, the presence of larvae of *Gasterophilus* sp. was detected in the same number of males and females (11 and 11, respectively), which constituted a total of 37.93% horses.

Another group of horses evaluated for the influence of sex and age on susceptibility to parasitic invasion was a group of animals at 2–5 year of age. In I study period, the equine warble flies were identified in 10% of mares and 10% of males (Tab. 1). Table 2 however, illustrates a different situation observed in II research period, when the number of infected males was twofold lower (25%) than females (50%).

The investigation of the age group including 76 horses (38 mares and 38 stallions) between 6–10 years revealed 21% of affected mares and 18.4% of infected males (Tab. 2). That gave evidence of *Gasterophilus* sp. occurrence in a total of 19.74% horses. In II research period, 58 horses underwent examination which showed the presence of equine warble fly larvae in the stomachs of 11 mares, which accounted for 37.9%, whereas in 2 stallions, i.e. 6.89% (Tab. 2).

Finally, the last age analyzed group comprised horses over 10 years. Just like in other groups, assessment of the invasion extensivity was conducted in two 10 days' periods of June (Tab. 1, 2). In the first 10 days (I research period), higher extensivity of the parasite prevalence was determined in mares (33.3%), while the infected males made up 11.1% in its sex group. A similar situation was observed in the third 10 days' period (II research period), when the larvae of *Gasterophilus* sp. were detected in 22.2% of mares and in 11.1% of males.

Table 1. Warble fly (*Gasterophilus sp.*) infestation in horses in the first 10 days of June
 Tabela 1. Występowanie inwazji *Gasterophilus sp.* u koni w I dekadzie czerwca

Specification Wyszczególnienie	Age Wiek																			
	up to 11 month do 11 miesiąca		1-2 years old 1-2 lata		2-5 years old 2-5 lat		6-10 years old 6-10 lat		more than 10 years > 10 lat											
	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂								
Sex Płeć																				
Presence of parasites Obecność pasożytów	+	-	+	-	+	-	+	-	+	-	+	-								
Number of horses Liczba koni	6	19	2	36	14	24	1	9	1	9	8	30	7	31	3	6	1	8		
Percentage of horses % koni	24	76	24	76	5.3	94.7	36.8	63.2	10	90	10	90	21	78.9	18.4	81.6	33.3	66.6	11.1	88.9
Number of horses in groups Liczba koni w grupach	50		76		20		76		18		76		18		76		18		18	
Number of infected horses Liczba koni zakażonych	12		16		2		15		4		15		4		15		4		4	
Number of healthy horses Liczba koni wolnych od pasożytów	38		60		18		61		14		61		14		61		14		14	
Percentage of infected horses % zakażonych koni	24		21.05		10		19.74		22.22		19.74		22.22		19.74		22.22		22.22	
Percentage of healthy horses % koni wolnych od pasożytów	76		78.95		90		80.26		77.77		80.26		77.77		80.26		77.77		77.77	

„+” – presence of parasites in stomach, obecność pasożytów w żołądku,
 „-” – no larvae in stomach, brak larw w żołądku

Table 2. Warble fly (*Gasterophilus* sp.) infestation in the horses in third 10 days' period of June
Tabela 2. Występowanie inwazji *Gasterophilus* sp. u koni w III dekadzie czerwca

Specification Wyszczególnienie	Age Wiek																			
	up to 11 month do 11 miesięcy		1-2 years old 1-2 lata		2-5 years old 2-5 lat		6-10 years old 6-10 lat		more than 10 years > 10 lat											
	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂								
Sex Płeć																				
Presence of parasites obecność pasożytów	+	-	+	-	+	-	+	-	+	-	+	-								
Number of horses Liczba koni	3	13	1	15	11	18	11	18	2	2	1	3	2	27	2	7	1	8		
Percentage of horses % koni	18.7	81.2	6.2	93.7	37.9	62.1	37.9	62.1	50	50	25	75	37.9	62.1	6.89	93.1	22.2	77.7	11.1	88.8
Number of horses in groups Liczba koni w grupach	32		58		8		58		18											
Number of infected horses Liczba koni zakażonych	4		22		3		13		3											
Number of healthy horses Liczba koni wolnych od pasożytów	28		36		5		45		15											
Percentage of infected horses % zakażonych koni	12.5		37.93		37.5		22.42		16.66											
Percentage of healthy horses % koni wolnych od pasożytów	87.5		62.07		62.5		77.58		83.33											

„+” – presence of parasites in stomach, obecność pasożytów w żołądku,

„-” – no larvae in stomach, brak larw w żołądku

Table 3. Extensivity of *Gasterophilus* sp. invasion with division into groups determined by sex (all age groups of horses)
 Tabela 3. Ekstensywność inwazji *Gasterophilus* sp. z podziałem na grupy zdeterminowane czynnikiem płci (wszystkie grupy wiekowe koni)

Specification Wyszczególnienie	1 st 10 days of June I dekada czerwca		3 rd 10 days' period of June III dekada czerwca	
	mares klacze	stallions/geldings ogier/walacze	mares klacze	stallions/geldings ogier/walacze
Presence of parasites Obecność pasożytów	+	-	+	-
Number of horses Liczba koni	20	100	29	91
Percentage of horses % koni	16.66	83.33	24.16	75.83
Number of all horses Liczba wszystkich koni	240			
Number of infected horses Konie zakażone	49			
Number of healthy horses Konie wolne od pasożytów	192			
Percentage of infected horses % zakażonych koni	20.4			
Percentage of healthy horses % koni wolnych od pasożytów	79.6			

„+” – presence of parasites in stomach, obecność pasożytów w żołądku,

„-” – no larvae in stomach, brak larw w żołądku

The analysis of the research results obtained from each study series in relation to the sex factor showed higher susceptibility of males to horse botfly invasion in I study period, while in II period of females. Susceptibility of males to stomach colonization by larvae of warble flies was comparable in both study periods (Tab. 3). However, higher variation was confirmed for mares.

The study findings referring to the first 10 days of June when a total of 240 horses from various age groups were studied revealed the percentage of 20.4% infected horses at that time. The presence of parasites was determined in 16.66% of mares and 24.16% geldings (Tab. 3). During the third 10 days' period of June, a total of 174 horses underwent the examination which exhibited that 25.8% of animals harbored the parasites, i.e. 34.8% mares and 18.39% of males.

The research results indicate a necessity to develop an effective pest management system for the control of warble fly infestation in horses.

DISCUSSION

The recent studies indicate that equine warble fly has remained an epizootiological problem afflicting animals all over the world [Gawor 1995].

In the USA, to reduce an increasing incidence rate of equine gasterophilosis, targeted control measures have been widely implemented [Drudge *et al.* 1975, Hass 1979, Reinemeyer *et al.* 1984]. Much information on the national and regional importance of horse botfly is available in research reports of various authors from various parts of the world [Agneesses *et al.* 1998, Borgsteede and Van Beek 1998, Lyon *et al.* 2000, Principatio *et al.* 1989].

The investigations conducted in two slaughterhouses in Ireland on the research material including 2552 horses exhibited an invasion of *Gasterophilus intestinalis* in 66.9% of horses examined in a slaughterhouse near Belfast. The presence of larvae was detected in each month, except August. The data collected by the same authors in another slaughterhouse in Dublin, showed increasing prevalence of the disease, which reached 90.8% of the horses inspected [Hatch *et al.* 1976].

Some different findings considering equine gasterophilosis prevalence were reported in northern England and Wales where the studies covered 448 horses [Edwards 1982]. The analysis of the research material identified warble fly larvae in 52.7% of horses. Out of the 143 aged <2 years, 92 animals got infected. Invasion extensivity in this case amounted to 64.3%. In the next age group – 2–6 yrs, the same number of horses underwent the examinations and, consequently, *Gasterophilus* sp. was detected in 70 animals (extensivity 49%). On the other hand, in a group of 162 horses at >6 years age, the parasite mean burden proved to be lowest and accounted for 46.3%. On necropsy examination, the warble fly larvae were recovered from the horses' stomachs in each month, except August. Invasion extensivity ranged from 10.7% in October up to 94.1% in December. The second instar larvae were collected from October through February, whereas third instars from November till July.

In Poland, the highest equine *Gasterophilus intestinalis* prevalence was determined by a research group headed by Stypuła. The study findings obtained from the examination of 883 horses established the highest extensivity of equine warble fly invasion in June – 91.9%.

The lowest number of the disorder occurrence was registered in August – 12.5%. Extensivity and intensity of the invasion for the studied period averaged 88.4% and 46%, respectively with wide fluctuations of the latter one persisting within the range of 2–218 larvae per horse [Stypuła *et al.* 1974]. Similar studies were performed on a comparable number of horses by another author who analyzed the research material obtained from 852 horses in the Warsaw Slaughterhouse (Warsaw District). The author exhibited the warble fly larva burden in on average 67.6% of the examined horses. The present research results have also confirmed the highest extensivity index recorded in December (90.7%) with relatively high extensivity from October through May [Draber-Mońko 1978]. Similar studies were also carried out by a group of scientists whose analyses performed in the slaughterhouse in Rawicz in the November-March period revealed the presence of *Gasterophilus* sp. larvae in 52.8% of examined horses [Pawlas *et al.* 2007].

In the late 80's, the necropsy studies were also made by another author [Gawor 1995] who examined 50 horses (23 mares and 27 geldings) from private farms. They were mature animals aged from 4 up to 25 years and 4 foals at 8–10 months of age. The author found that 40% of horses managed in the farms were infected by larvae of *Gasterophilus intestinalis* flies. The invasion was detected at any age of animals – from 8 months up to 25 years. The mean larval intensity was 52 larvae per horse. Two foals were shown to harbor 23 and 63 warble fly larvae, respectively.

A decrease in gasterophilosis incidence reported recently in Poland is most likely associated with a declined number of horse population in farms. In the years 1950–1970, the number of horses amounted to 2.5 mln, including farm animals – 97.5% [Gawor 2002]. The following years were marked with a persistent fall in the horse number, i.e. from 1204 thousand in 1987 to 941 thousand in 1990. Although recently an increase of saddle horse population has been recorded, its total number does not surpass 500 000 units.

Extensivity of warble invasion shows a marked seasonal distribution and changes due to larva developmental stages. From June to September, the larvae detach from the gastrointestinal tract and leave the host; at that time, the post mortem examinations confirm the lowest frequency of invasion. In Poland the maximum intensity of invasion is observed from October to June with average infection extensivity – 88.4%, whereas the minimum invasion frequency in August – 12,5% [Gawor 2002, Stypuła *et al.* 1974].

Substantial extensivity of equine gasterophilosis is related to the rapid spread of the infection throughout a heard. In Poland, horses from private farms graze the pasture alone or with other species of domestic livestock that may reduce the horse bot infestation spread. The investigations conducted in Poland by Gawor [1995] indicated that the research results obtained are comparable with those from other years. Thus, it follows that although a considerable decline in the heads of horses was noted, equine gasterophilosis remained an emergent problem critical to nearly all breeders.

Identification of the larvae of warble fly burden in foals implies that the effective control measures should be included into the parasite prevention program of juvenile animals in their first months of life. Haas highlighted a case of 3-month-old foals with recognized infection by *Gasterophilus intestinalis*, reporting no difference in extensivity and intensity of invasion between foals and mature horses [Haas 1979]. The findings have been also supported by another research group whose study revealed the presence of warble fly larvae in even younger horses – the foals aged 57–84 days [Lyons *et al.*, 1985].

CONCLUSIONS

1. Gasterophilosis was recognized in horses at varied age.
2. The highest extensivity of invasion was established in the following horse age groups: 1–2 years and 2–5 years.
3. Mares proved to be more susceptible to stomach colonization by the larvae of warble flies.
4. The highest intensity of invasion was determined in horses aged over 10 years and mares.
5. The present studies have shown that equine bot infestation is still a significant challenge for horse breeders.

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Streszczenie. Pasożyty koni stanowią istotny problem w hodowli, gdyż zagrażają nie tylko zdrowiu, ale także i życiu tych zwierząt.

Wśród inwazji pasożytniczych szczególne miejsce zajmują gzawice. Jest to grupa schorzeń przebiegających najczęściej bezobjawowo. Inwazje te mają jednak ogromny wpływ na rozwój młodych koni. Fakt ten związany jest z cyklem rozwojowym pasożyta, który w trakcie swego rozwoju doprowadza do poważnych uszkodzeń tkanek.

Badania wykazały wzrost występowania pasożytów *Gasterophilus* sp. w żołądku koni z 20,4% w I dekadzie czerwca do 25,8 % w III dekadzie tego miesiąca. W pierwszym okresie badań inwazją częściej dotknięte były samce (24,16%), a w drugim okresie badań – klacze (33,3%).

Największą ekstensywność inwazji stwierdzono w II serii badawczej, u koni w wieku 2–3 lat (37,93%), a grupą koni w najmniejszym stopniu dotkniętą inwazją były zwierzęta 2–5-letnie badane w I dekadzie czerwca.

Słowa kluczowe: konie, gzawica, *Gasterophilus* sp.