

Presence of *Gasterophilus* Species in Horses in Van Region

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SUMMARY

Ten horses aged 3-4 from rural Van region in the Eastern border of Turkey were examined post-mortem for the presence of *Gasterophilus* larvae from December 2008 to March 2009. Stomachs and intestines were removed according to the suitable necropsy techniques and checked for *Gasterophilus* species. Three horses were infected by larvae of *Gasterophilus* spp. and one second stage larvae (L2) and 265 third stage larvae (L3) collected from infested horses. Three species of *Gasterophilus* were identified with the following total larvae number and rate, respectively: *Gasterophilus nasalis* (182 / 68.42%), *Gasterophilus intestinalis* (76 / 28.57%), *Gasterophilus inermis* (8 / 3%).

Key Words

Gasterophilus, Horse, Van

Van Yöresindeki Atlarda Tespit Edilen *Gasterophilus* Türleri

ÖZET

Türkiye'nin doğu sınırındaki Van ilinin kırsal kesiminde yaşayan 3-4 yaşlarındaki on at Aralık 2008 - Mart 2009 tarihleri arasında *Gasterophilus* türlerinin varlığı yönünde post mortem incelenmiştir. Nekropsi tekniğine uygun olarak mide ve bağırsaklar çıkarılmış ve *Gasterophilus* türlerinin varlığı araştırılmıştır. Üç at *Gasterophilus* larvalarıyla enfeste bulunmuş ve bir adet ikinci dönem larva, 265 adet üçüncü dönem larva toplanmıştır. Çalışmada üç *Gasterophilus* türü teşhis edilmiş ve türlere göre toplam larva sayıları ve oranları *Gasterophilus nasalis* (182 / %68.42), *Gasterophilus intestinalis* (76 / %28.57), *Gasterophilus inermis* (8 / %3) olarak belirlenmiştir.

Anahtar Kelimeler

Gasterophilus, At, Van

INTRODUCTION

Larvae of flies belonging to the genus *Gasterophilus* (Diptera: Oestridae) are common obligate parasites in the gastrointestinal tract of equine (including horses, donkeys and zebras) and cause gastrointestinal myiasis. Inseminated females deposit their eggs on the hosts' hair at different locations depending on the species of *Gasterophilus*. *Gasterophilus pecorum* is an exception as females lay their eggs on grass, leaves and stems of plants. Larvae at the first stage reach the oral cavity of horses passively (*G.intestinalis*, *G.pecorum*) or actively. The larvae stay in the oral cavity for some time, and are then followed by instars, and as larvae at the second stage inhabit typical sites such as the stomach and duodenum where they grow and transform into the third stage larvae, which leave the host after a few months and then metamorphose into chrysalis from which insects emerge into the environment (Zumpt 1965; Soulsby 1982).

These larvae use their anterior spines and mouth hooks to attach to the wall of the gastrointestinal tract. Generally, gasterophilosis is characterized by difficulties in swallowing (throat localization of the immature stages), gastro and intestinal ulcerations, gut obstructions or volvulus, rectal prolapses, anaemia, diarrhoea and digestive disorders (Waddell 1972; Dart et al. 1987; Principato 1988; Cogley and Cogley 1999; Sandin et al. 1999; Sequeira et al. 2001). Perforation or rupture of the gastrointestinal tract with resulting peritonitis has been documented as sequelae of *Gasterophilus* infection

(Lockhart 1915; Oyarzum 1939; van der Kolk et al. 1989). They also have some zoonotic potential as they are occasionally reported to affect humans, where they are found subcutaneously or in the digestive tract (Zumpt 1965; Royce et al. 1999; Anderson 2006).

Seven of the nine known *Gasterophilus* species, were described in Turkey, namely *G.intestinalis*, *G.nasalis*, *G.haemorrhoidalis*, *G.pecorum*, *G.inermis*, *G.nigricornis*, *G.meridionalis* (Sayın and Mimioglu 1968; Mercivenci 1970; İça and Yıldırım 2005; Gökçen et al. 2008). In Turkey, data on the prevalence and the presence of *Gasterophilus* larvae in equine are limited. The objective of the present study was to determine the presence of *Gasterophilus* species in horses living in rural region of the Eastern border of Turkey.

MATERIALS and METHODS

This study was performed using ten native horses died due to various reasons from December 2008 to March 2009. All horses lived in rural Van region in the Eastern border of Turkey and are used as pack animal under difficult conditions. The age and sex of each animal were recorded, but no information was available on the history of the horses, pasture, anti-parasitic treatment and cause of death.

After removal of the gastrointestinal tract at autopsy, the stomach and intestines were examined in detail to determine the presence of *Gasterophilus* larvae. The stomach was opened along the greater curvature from the

cardia orifice to the pylorus. The intestine was opened along the mesenteric line along the entire length of the organ up to the rectal ampulla. All the larvae were collected and counted by their stages. An attempt was made to locate. All larvae collected were washed in saline solution (NaCl 0.9%) and were stored in 70% ethanol. Larvae were identified using a stereomicroscope. Morphological identification was based on the description of Zumpt (1965).

This study was conducted in Van province. This region is located at the 42°40'E and 44°30'E longitude and 37°43'N and 39°26'N latitude, is at an altitude of approximately 1.725 meters and has close borders to Iran eastern. The area has change over type climate between terrestrial and Mediterranean climate of Central Anatolia and Southeast Anatolia regions.

RESULTS

The larvae of *Gasterophilus* spp. were found in three (30%) of the ten horses autopsied. Three species of *Gasterophilus* were identified: *Gasterophilus intestinalis*, *Gasterophilus nasalis* and *Gasterophilus inermis*. All infestation were mix. Two of infested horses were infested with *G.intestinalis* and *G.nasalis*, the other were infested with *G.nasalis* and *G.inermis*. When taking into account total larvae number collected infested animals, *G.nasalis* was the most common species (68.42%) followed by *G.intestinalis* (28.57%) and *G.inermis* (3%). (Table 1). The post mortem examination of the horses revealed the occurrence of 3rd instars of *Gasterophilus* spp. larvae dominated. The 2rd instars larvae were found only one number in one infected horse that was *G.intestinalis*. A total of 265 third stage larvae (L3) were collected from infested horses. *Gasterophilus* larvae collected were located in the stomach and the duodenum of each of them. Infested three horses harbored 114, 81 and 71 larvae (Table 1). The geometric mean intensity of bot larvae were 88.66.

Because all horses made post mortem examination was at same sex (female) and age range (3-4 years), the influence of the sex and age to gasterophilosis could not be explained.

Gasterophilus species and larval number for each infested horses are shown in Table 1.



Figure 1. Crater-like ulcerative lesions and 3rd instars *Gasterophilus* larvae on the horse stomach mucosal membrane

Şekil 1. Enfeste atın mide mukozasındaki 3. dönem *Gasterophilus* larvaları ve krater benzeri ülseratif lezyonlar.

Table 1. *Gasterophilus* species and larval number for each infested horses

Tablo 1. Enfeste atların herbirinde bulunan *Gasterophilus* türleri ve larva sayıları

Infested horses	<i>Gasterophilus</i> species and larval number (%)			Total larvae number
	<i>G.nasalis</i>	<i>G. intestinalis</i>	<i>G. inermis</i>	
No 1.	85	29	-	114
No 2.	34	47	-	81
No 3.	63	-	8	71
Total	182 (68.42)	76 (28.57)	8 (3)	266

DISCUSSION

The prevalence of botfly larvae in animals poses a serious epizootic and economic problem in several world areas. The prevalence of *Gasterophilus* species has been investigated in different countries. They are currently worldwide distribution in horses (Drudge et al. 1975; Pandey et al. 1980; Edwards 1982; Sharir 1987; Sweeney 1990; Bernard et al. 1994; Hoglund et al. 1997; Agneessens et al. 1998;).

Although Turkey is a suitable country in terms of climatic and ecological factors for spread of *Gasterophilus* species and most of the known *Gasterophilus* species including *G.intestinalis*, *G.haemorrhoidalis*, *G.nasalis*, *G.inermis*, *G.pecorum*, *G.meridionalis* and *G.nigricornis* were previously introduced in Turkey, studies on the presence and prevalence of these species in different regions of Turkey are limited. In Turkey, bot fly larvae were reported in Ankara (Sayın and Mimioglu 1968; İça and Yıldırım 2005), Bursa (Tınar et al. 1994) and Urfa (Gökçen et al. 2008). *Gasterophilus* spp. larvae were identified in three (30%) of the ten horses autopsied in this study. This rate is similar to those of in Ankara (33% - Sayın and Mimioglu 1968; 34% - İça and Yıldırım 2005), higher than in Urfa (9.82% - Gökçen et al. 2008).

In other studies done in various regions of the world, prevalence of infestation ranged from 9% to 100% including 9% in Germany (Ribbeck et al. 1983), 11.1% in Israel (Sharir et al. 1987), 12.3% in Sweden (Hoglund et al. 1997), 34% in France (Bernard et al. 1994), 43% in Ireland (Sweeney 1990), 53% in England and Wales (Edwards 1982), 58% in Belgium (Agneessens et al. 1998), 65% in Switzerland (Brocard and Pfister 1991), 82.2% in Italy (Otranto et al. 2005), and 98.7% in Kentucky, USA (Drudge et al. 1975), 100% in Morocco (Pandey et al. 1980).

While *G.intestinalis* (De Geer, 1776) and *G.nasalis* (Linnaeus, 1758) are distributed worldwide and are often the only species reported in many parts of the New World (e.g., United States and in New Zealand) (Schooley et al. 197; Kettle 1974), the remaining species are only reported in very limited areas of Europe, Eastern Countries including central Italy (Zumpt 1965; Principato et al. 1984; Egri et al. 1995) and Africa (Horak et al. 1984). The dominance of these two *Gasterophilus* species larvae in the present study is similar to that previously reported from horses in Italy (Principato 1989; Otranto et al. 2005) and from donkeys in Northern Jordan (Mukbel et al. 2001), from horses and donkeys in Ankara (İça and Yıldırım 2005), from Arabian Horses in Urfa (Gökçen et al. 2008), from horses in Poland (Studzińska and Wojcieszak 2009). Principato (1989) reported that during four seasons of observation (1983-1986) the number of *G.inermis*,

G.pecorum and *G.haemorrhoidalis* decreased relative to *G.intestinalis* and *G.nasalis* species.

These differences in the species composition, prevalences and larval burdens of *Gasterophilus* spp. in different countries are probably due to ecological conditions, management factors (e.g., pharmaceutical treatments, different animal husbandry), the host (e.g., genetic differences, race susceptibility) and the parasite (e.g., genetic differences, population composition).

In this study, the seasonal range of *Gasterophilus* spp. larvae was not attempted. But, almost larvae collected from all horses necropsied between December and March were third stage larvae. These results are consistent with data registered by Pawlas-Opiela and Sołtysiak (2007), by Studzińska and Wojcieszak (2009) and by Gökçen et al. (2008). Otranto et al. (2005) reported that L3 of *G.intestinalis* and *G.nasalis* were found throughout the observation period, with the lowest mean intensity of L3 from September to November for both species and the highest mean intensities from January to August. Similarly, in central Italy, the highest incidence of *G.intestinalis* and *G.nasalis* L3 was noted in February–March with a decrease in the following months (Principato 1989).

There is no evidence for a significant relationship between prevalence and mean intensity with age and sex of the host (Draber-Mońko 1970; Pfister and Brocard 1996; Agneessens et al. 1998; Mukbel et al. 2001; Romaniuk and Snarska 2002; Gökçen et al. 2008). But, the higher prevalence in female than male animals was reported by some authors (Merdivenci 1970; İça and Yıldırım 2005). Moreover, Edwards (1982) reported that prevalence of infection and mean larval burdens declined with increasing age of host. All horses in present study were at same sex (female) and age range. Under such circumstances, the correlation between the prevalence of gasterophilosis and the sex and age may be misunderstood.

To decide at about state of gasterophilosis in horses in this region, works conducted on more animals must be done. But, infestation in the three of the ten horses autopsied cannot be underestimated and *Gasterophilus* infestation in Van province has been reported for the first time with the present study. Gasterophilosis in horses in this region may be probably affected by the perhaps not treatment with antiparasitic drugs, bad management factors such as poor maintenance conditions and to work under severe conditions, free grazing animals, which heighten to contact with female botflies, to live with other equine reservoired to these larvae causing gastrointestinal myiasis.

REFERENCES

- Agneessens J, Engelen S, Debever P, Vercruysse J (1998). *Gasterophilus intestinalis* infections in horses in Belgium. *Vet Parasitol*, 77, 199-204.
- Anderson JR (2006). Oestrid Myiasis of Humans. In: The Oestrid Flies: Biology, Host – Parasite Relationships, Impact and Management, DD. Colwell, M J R Hall & P J Scholl (Ed), 201 – 209. CAB International, Oxford, U.K.
- Bernard N, Collobert C, Tariel G, Lamidey C (1994). Epidemiological survey of bot infection in horses at necropsy in Normandy from April 1990 to March 1992. *Rec Med Vet*, 170, 231-235.
- Brocard P, Pfister K (1991). The epidemiology of gasterophilosis of horses in Switzerland. *Schweiz Arch Tierheilkd*, 133, 409-416.
- Cogley TP, Cogley MC (1999). Inter-relationship between *Gasterophilus* larvae and the horse's gastric and duodenal wall with special reference to penetration. *Vet Parasitol*, 86, 127-142.
- Dart AJ, Hutchins DR, Begg AP (1987). Suppurative splenitis and peritonitis in a horse after gastric ulceration caused by larvae of *Gasterophilus intestinalis*. *Aust Vet J*, 64, 155-158.
- Draber-Mońko A (1970). Investigations into the biology of fly larvae belonging to *Gasterophilidae* (Diptera). *Frag Faun*, 16, 89-117.
- Drudge JH, Lyons ET, Wyant ZN, Tolliver SC (1975). Occurrence of second and third instars of *Gasterophilus intestinalis* and *Gasterophilus nasalis* in stomachs of horses in Kentucky. *Am J Vet Res*, 36, 1585-1588.
- Edwards GT (1982). The prevalence of *Gasterophilus intestinalis* in horses in northern England and Wales. *Vet Parasitol*, 11, 215-222.
- Egri B, Sarkozy P, Banhidy G (1995). Prevalence of botfly larvae and lice in studs of North Caucasus (Stawropol County, Russia). *Acta Vet Hung*, 43, 287-289.
- Gökçen A, Sevgili M, Altaş MG, Çamkerten İ (2008). Presence of *Gasterophilus* species in Arabian Horses in Sanliurfa Region. *Türkiye Parazitoloj Derg*, 32 (4), 337 – 339.
- Hoglund J, Ljungstrom BL, Nilsson O, Lundquist H, Osterman E, Uggla A (1997). Occurrence of *Gasterophilus intestinalis* and some parasitic nematodes of horses in Sweden. *Acta Vet Scand*, 38, 157-165.
- Horak IG, De Vos V, De Klerk BD (1984). Parasites of domestic and wild animals in South Africa. XVII. Arthropod parasites of Burchell's zebra, *Equus burchelli*, in the eastern Transvaal Lowveld. Onderstepoort, *J Vet Res*, 51, 145-154.
- İça A, Yıldırım A (2005). Ankara hayvanat bahçesinde kesimi yapılan tek tırnaklılarda *Gasterophilus* türlerinin yayılışı. *Erciyes Üniv Vet Fak Derg*, 2(1), 5-8.
- Kettle PR (1974). The genus *Gasterophilus* in the horse in New Zealand. *N Z Vet J*, 22, 43-45.
- van der Kolk JH, Sloet van Oldruitenborgh-Oosterbaan MM, Gruys E (1989). Beiderzijdse pleuritis na een oesofagusfistel bij het paard als complicatie van een *Gasterophilus*-infectie. *Tijdsch Diergeneeskd*, 114, pp. 769-774.
- Lockhart AA (1915). Bots-perforation of the duodenum-death. *Am Vet Rev*, 47, pp. 476-477.
- Merdivenci A (1970). Türkiye Parazitleri ve Parazitolojik Yayınları. İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi Yayınları, İstanbul.
- Mukbel R, Torgerson PR, Abo-Shehada M (2001). Seasonal variations in the abundance of *Gasterophilus* spp. larvae in donkeys in Northern Jordan. *Trop Anim Health Prod*. 33, 501-509.
- Otranto D, Milillo P, Capelli G, Colwell DD (2005). Species composition of *Gasterophilus* spp. (Diptera, Oestridae) causing equine gastric myiasis in Southern Italy: parasite biodiversity and risks for extinction. *Vet Parasitol*, 133, 111-118.
- Oyarzum R (1939). Peritonitis consecutiva a la perforacion del segmento inicial del duodeno producida por gastrofilos. *Rev Med Vet Parasitol*, (Caracas) 1, pp. 196-197.
- Pandey VS, Ouhelli H, Elkhalfane A (1980). Observations on the epizootiology of *Gasterophilus intestinalis* and *G. nasalis* in horse in Morocco. *Vet Parasitol*, 7, 347-356.
- Pawlas-Opiela M, Sołtysiak Z (2007). Prevalence and intensity of *Gasterophilus* sp. larvae in horses from North-East Poland. *Acta Sci Polon – Med Vet*, 6, 29-36.
- Pfister K, Brocard P (1996). Gasterophilosis. *Parasitologia*, 38, 405.
- Principato M (1988). Classification of the main macroscopic lesions produced by larvae of *Gasterophilus* spp. (Diptera: *Gasterophilidae*) in free-ranging horses in Umbria. *Cornell Vet*, 78, 43-52.
- Principato M (1989). Observations on the occurrence of five species of *Gasterophilus* larvae in free-ranging horses in Umbria, central Italy. *Vet Parasitol*, 31, 173-177.
- Principato M, Piergili Fioretti D, Moretti A (1984). Diffusione ed incidenza di *Gasterophilus* spp. negli equini dell'Umbria. *Atti della Società Italiana delle Scienze Veterinarie* 38, 744-748.
- Ribbeck R, Heide H, Schicht W, Heipe T (1983). Beiträge zur Parasitenfauna der DDR: VII. Untersuchung zum Vorkommen von *Gasterophilus*-Larven bei Pferden. *Angew Parasitol*, 24, 39-49.
- Romaniuk K, Snarska A (2002). Existence of horse botfly *Gasterophilus intestinalis* eggs on coats of mares, suckling colts and young mores and colt of primitive Polish horses. *Medycyna Wet*, 58, 641-643.

- Royce LA, Rossignol PA, Kubitz ML, Burton FR (1999).** Recovery of a second instar *Gasterophilus* larva in a human infant: a case report. *Am J Trop Med Hyg*, 60, 403–404.
- Sandin A, Skidell J, Haggstrom J, Girma K, Nilsson G (1999).** Post-mortem findings of gastric ulcers in Swedish horses up to one year of age: a retrospective study 1924–1996. *Acta Vet Scand*, 40, 109–120.
- Sayın F, Mimioglu M (1968).** Türkiye’de tek tırnaklılarda bulunan *Gasterophilus* türleri üzerinde araştırmalar. *Ankara Üniv Vet Fak Derg*, 15, 75-91.
- Schooley MA, Marsland WP, Fogg TJ (1971).** Monthly distribution of *Gasterophilus* species in horses in the United States—implication on treatment schedules. *Vet Med Small Anim Clin*, 66, 592–593.
- Sequeira JL, Tostes RA, Oliveira-Sequeira TC (2001).** Prevalence and macro- and microscopic lesions produced by *Gasterophilus nasalis* (Diptera: Oestridae) in the Botucatu Region, SP, Brazil. *Vet Parasitol*, 102, 261–266.
- Sharir B, Pipano E, Markovics A, Danieli Y (1987).** Field studies on gastrointestinal infestation in Israeli Horses. *Isr J Vet Med*, 43, 223-227.
- Soulsby E JL (1982).** Helminths, Arthropods and Protozoa of Domesticated Animals, sixth ed. Baillie`re Tindall, London, UK.
- Studzńska MB, Wojcieszak K (2009).** *Gasterophilus* sp. botfly larvae in horses from the South-Eastern part of Poland. *Bull Vet Inst Pulawy*, 53, 651-655.
- Sweeney HJ (1990).** The prevalence and pathogenicity of *Gasterophilus intestinalis* larvae in horses in Ireland. *Irish Vet J*, 43, 67-73.
- Tınar R, Coşkun Ş, Aydın L, Çırak V, Demirel M (1994).** Bursa orjinli atlarda saptanan parazitler. *Uludağ Üniv Vet Fak Derg*, 13, 11-16.
- Waddell AH (1972).** The pathogenicity of *Gasterophilus intestinalis* larvae in the stomach of the horse. *Aust Vet J*, 48, 332– 335.
- Zumpt F (1965).** Myiasis in Man and Animals in the Old World. Butterworths, London.