

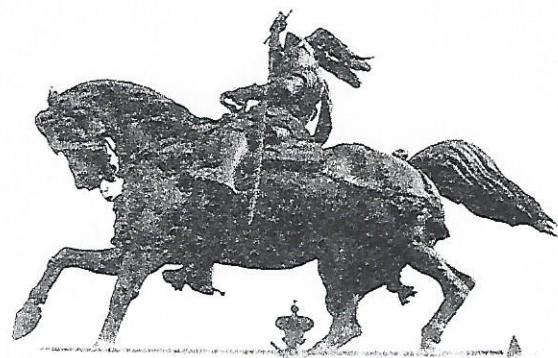
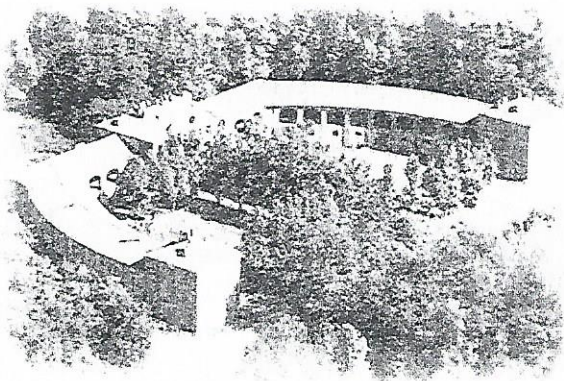


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## Parasitological surveys on equine oral gasterophilosis

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**Riassunto:** Viene studiata la migrazione delle cinque specie di *Gasterophilus* presenti in Italia attraverso l'identificazione delle larve migranti nel cavo orale di n. 76 equini. Si rileva come ciascuna specie abbia dei siti anatomici ben definiti, rappresentati dalla lingua e dagli spazi interdentali per *G. intestinalis*, dal colletto gengivale per *G. nasalis*, dalle guance e dalla commensura labiale per *G. inermis*, dall'epidermide delle labbra per *G. haemorroidalis* e dal palato duro per *G. pecorum*. Quest'ultima specie è l'unica a divenire larva III nel cavo orale, a livello del palato molle.

**Parole chiave:** *Gasterophilus*, larve, migrazione orale.

**Summary:** Studied herein is the oral migration of the five species of *Gasterophilus* present in Italy by the means of the identification of migrating larvae in the oral cavity of n: 76 horses. Each species has its own well defined anatomical place represented by the tongue and periodontal spaces for *G. intestinalis*, by gums for *G. nasalis*, by cheeks and labial commissure for *G. inermis*, by lip skin for *G. haemorroidalis*, by hard palate for *G. pecorum*. The last species is the only one becoming larva III in the oral cavity, at the soft palate level.

**Keywords:** *Gasterophilus*, larvae, oral migration.

### Introduction

Equine gasterophilosis is a cavitory myiasis produced by larvae of flies of the family *Gasterophilidae*. It is a parasitic disease spread throughout the world and most common in horses, donkeys and zebras; nevertheless other animals, including humans, can host larvae of this insect (Principato *et al.*, 1996; Battisti *et al.*, 1997). As it is known, all larval stages, from stage I to III, are strongly parasitic and held within the vertebrate host. This evolution involves the colonization of different anatomical regions of the animal and the development of subsequent disorders that are typical of this myiasis.

Depending on the species of parasite or on parasitic associations of more species, both the damage and the symptoms may be different.

Although well-known, the detection phase of gastrointestinal parasites, which leads to the development of larvae of the III stage, is not yet investigated, the oral larval migration, when the larvae change from stage I to stage II. In this phase, in fact, the animals show major problems and parasites should be considered in the acute stage. Even before the larva I enters the equine mouth, there is a period of risk for humans, still little known, represented by so-called "residual larvae" present inside the eggs laid on the animal coat. These are larvae that the animal has not yet taken, remained inside the egg chorion until the end of summer and, sometimes, in early autumn. These larvae are destined to die, which, with the passage of time, lose their parasitic specificity and can penetrate the human skin. By brooming or riding the animal without special precautions, it is possible outbreak of myiasis in humans. The awareness of this risk and shortage of specialistic studies on the oral parasitosis (Tolliver *et al.*, 1974; Principato *et al.*, 1991) have induced us to make some biomorphologic remarks, that we believe may be of interest to clarify certain aspects of the biological cycle of these parasites.

### Material and Methods

In order to test the oral migration of larvae I and II of the various species of *Gasterophilus* present in Italy, we used the samples that we collected over the past 15 years in Umbria and stored in the freezer of the Section of Parasitology (Department of Biopathological Science and Hygiene of Food and Animal Production, Faculty of Veterinary Medicine, Perugia), referred to n°28 horses. For the morphological examination and species identification we also used the material preserved in alcohol, deposited in the Urania Research Centre of Perugia, referred to n°48 horses. The migrant larvae in the oral cavity were removed from the intradermal tunnels and put in alcohol 80°; some of them were dissected and their cephalo-pharyngeal skeleton and posterior spiracles mounted in Berlese solution.

Larvae III found in the soft palate were identified by the means of Principato analytical keys (1986, 1987a, 1987b; Principato and Tosti, 1988 and 1991), in respect to morphological cephalo-pharyngeal skeleton and pro-thoracic and post-abdominal spiracles.

Draber-Monko (1978), Grunin (1969) and Zumpt (1965) analytical keys were used to identify the species of larvae *in toto*.

### Results and Discussion

A total of 5572 larvae were studied: n°3715 larvae, already preserved in alcohol (Urania Collection), removed from various anatomical sites of oral tract of 48 horses; n° 1857 larvae were directly removed from the oral mucosa of n° 28 horses, whose heads had been kept in freezers: n°281 of those larvae were dissected and mounted in Berlese solution and n° 1576 were preserved in alcohol.

The species identified were: *Gasterophilus intestinalis* (42.3%), *G. pecorum* (50.2%), *G. nasalis* (3%), *G. inermis* (4%) and *G. haemorrhoidalis* (0.5%).

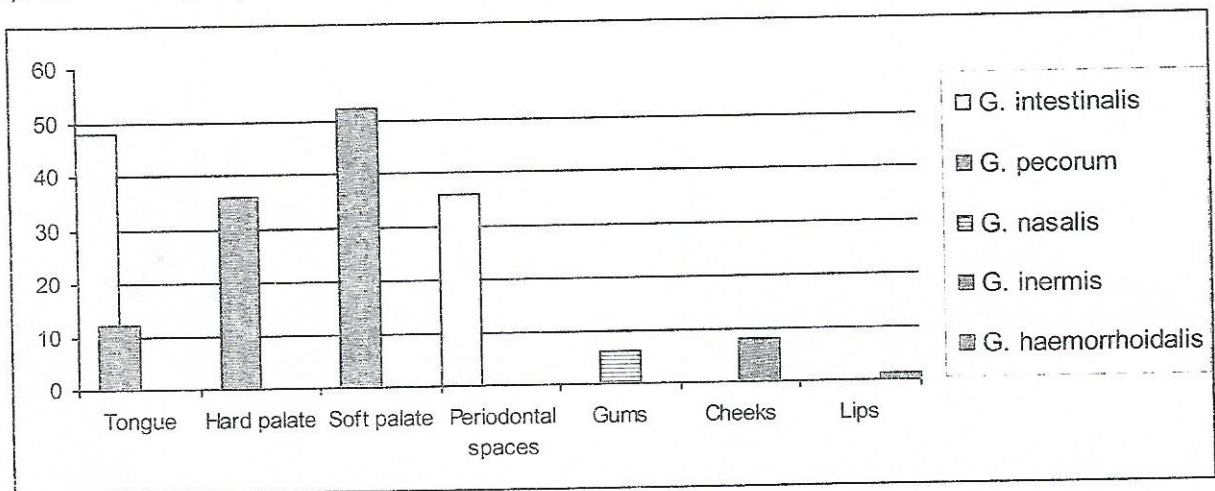


Figure 1. Mean distribution of all *Gasterophilus* spp. larvae detected in the oral cavity of examined horses.

The anatomical districts colonized differed in relation to species (Fig. 1) and were represented by: 1) dorsal region of the tongue (*G. intestinalis* and *G. pecorum*) (Fig. 2), 2) hard palate (*G. pecorum*) (Fig. 3), 3) soft palate (*G. pecorum*), 4) interdental spaces (*G. intestinalis*), 5) gums (*G. nasalis*), 6) inside cheeks (*G. inermis*), 7) internal lips (*G. haemorrhoidalis*).

The anatomical distribution of larvae was quantitatively different in relation to developmental stage (I or II). The colonization of the soft palate only by the larvae III of *G. pecorum* appeared peculiar. In this case, after the oral migration as larvae stage II, they were fixed firmly to the soft palate, increasing significantly in volume and reaching the stage III.

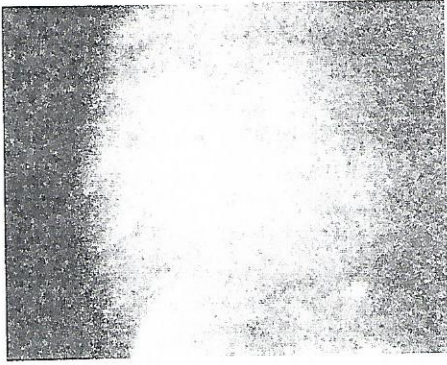


Figure 2. Larvae I of *G. intestinalis* in horse tongue.

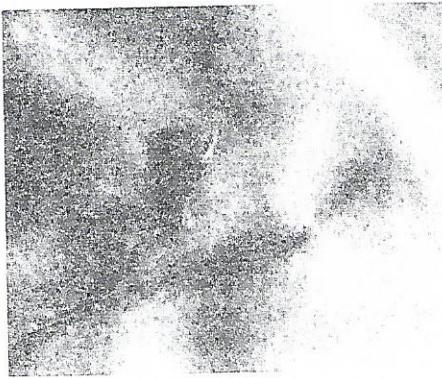


Figure 3. Larvae I of *G. pecorum* in the horse palate.

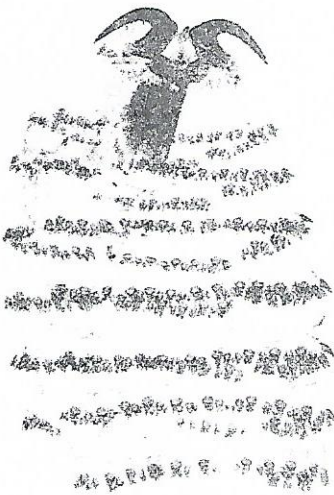


Figure 4. Larva II of *G. pecorum*.

### Discussion and Conclusions

Our first observation concerns *G. intestinalis*, which is considered to be the most frequent species in Italy. We believe that the larvae of this species, completed the migration on the back of the horse tongue, lead directly into the periodontal spaces (Principato and Camerlengo, 1994), in contrast to what suggested by Zumpt (1965), and make a short stop there before being swallowed and moving in the stomach. Some of them do not end the migration on the tongue and moved already in the stage I in the periodontal spaces, where they change rapidly into stage II. This is demonstrated by the size of the larvae I and II, which in that place are very similar, and those known to occur in the stomach at the beginning of colonization. We do not believe also that there is a systematic involvement of the pharynx by this species, as reported by several authors (Chereshnev, 1953; Dinulescu, 1932; Harwood, 1979; Keilin *et al.*, 1946; Knipling, 1934; Schroeder, 1940; Wehr, 1933 a, b, c; Wells, 1938; Zumpt, 1965), for we did not find any larva in this anatomical district.

At the level of the soft palate, however, we found several larvae III of *G. pecorum*, came here as larvae II directly from the hard palate (Fig. 4). This condition is the rule for this species. After the long migration (about 1 month), in fact, *G. pecorum* staging an equally long time also in the soft palate, as larva III, and comes in the stomach one month later. This causes a difficulty of insertion into the stomach mucosa because it is regularly already colonized by *G. intestinalis* larvae. Most of the larvae of *G. pecorum*, therefore, not being able to fix into the stomach mucosa, are evacuated in the faeces. In our opinion, this is the reason for the low number of specimens of this species that is usually found in the stomach, despite the high number of larvae we found in the oral tract (Principato, 1990).

Regarding *G. inermis*, we believe that the larvae of this species may change in the cheek mucosa, where we found some larvae II of the same size as those normally observed in the rectum (Principato *et al.*, 1985; Piergili Fioretti *et al.*, 1996; Rastegaev, 1981).

As it is still unknown where the larvae change to the stage II, our data may suggest that this may occur in the cheek mucosa.

Regarding *G. nasalis*, our data can confirm the specificity of this species for gums, where it changes into stage II (Principato, 2002).

As regards *G. haemorrhoidalis*, we confirm what it was said in our previous studies concerning the rarity of this species in Italy and confirm the distribution of larvae I and II in the lip

mucosa.

Finally, it seems interesting to note the active penetration of the larvae of *G. nasalis*, *G. inermis* and *G. haemorrhoidalis* on the mouth and, consequently, the possibility for them to penetrate easily, in few minutes, even in human skin. Therefore, the gasterophilosis may be a zoonosis and, contrarily to popular belief, it can cause dermatitis in the horse when newborn larvae of *G. inermis* attempt to penetrate the mouth.

Therefore, equine oral gasterophilosis must be considered as acute pathology, unlike the later gastrointestinal stage, and a polyspecific parasitic infestation, usually with variable clinical outcome in relation to the position and the prevalent species of *Gasterophilus* (Principato, 1988; Principato *et al.*, 1990; Principato *et al.*, 1992).

On the basis of our observations, we can make the following remarks; in order to decide if and when a proper treatment is advisable:

a) the three most frequent species in Italy, *G. intestinalis*, *G. nasalis* and *G. inermis*, almost always associated, at the end of summer (September-October) cause a clear inflammation of horse oral cavities and it is therefore useful to treat them in this period.

b) the interdental systematical location of *G. intestinalis* allows to easily monitor the oral migration of this species and to know exactly in which period a gastric treatment is more advisable.

c) the massive infestation by *G. pecorum* must worry the veterinary surgeon only because of the disorders caused by the migrating larvae in the palate and, above all, because of their pharyngeal location. Since in the stomach their number in fact reduces remarkably because of territorial competition with *G. intestinalis*, it is advisable to make only an oral treatment.

Good hygiene of horse coat, particularly in late summer, it is always advisable to reduce the human infestation and to avoid possible complications of zoonotic character.

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