

MOVEMENT OF STOMACH BOTS (*GASTEROPHILUS INTESTINALIS* AND *GASTEROPHILUS PECORUM* LARVAE) IN THE ORAL CAVITY OF DONKEYS (*EQUUS ASINUS*).

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SUMMARY:

Examinations were carried out on oral cavities of 56 and 15 donkeys naturally infested with *Gasterophilus intestinalis* and *G. pecorum*, respectively. Developing immature larvae of these two species showed a specific pattern of movement within the oral cavity of donkeys. First instars of *G. intestinalis* burrowed in the dorsal mucosa of the tongue and invaded the interdental spaces of the upper arcade teeth. Second instar larvae also developed there and in the pharynx. First instars of *G. pecorum* burrowed in the mucous membrane of the hard palate, cheeks and tongue. They dispersed into the soft palate and root of the tongue, where 2nd instars developed. Second instars moved to the pharynx, where they remained until the moult to 3rd instar. Like *G. intestinalis*, the dispersing 1st instars produced perpendicular air holes for breathing.

INTRODUCTION

In Egypt, the donkey has been considered an indispensable animal to farmers with limited financial resources, primarily as a draft animal. Infestation of donkeys with *Gasterophilus* spp. is a common parasitic problem in many countries (Hilali et al., 1987 in Egypt; Alanis Tafolla, 1983 in Mexico; Rastegaev, 1984 in USSR; Kilani et al., 1986 in Tunisia).

The route followed by *G. intestinalis* larvae in the oral cavity of the horse was described by Cogley

et al. (1982). Corresponding studies in the donkey are lacking. No complete investigation of the oral migration of *G. pecorum* has been yet published although Dinulescu (1932) earlier observed that the 1st instars of *G. pecorum* penetrated the lips, gums, cheeks, tongue and hard palate. Chereshev (1951) found that the second moult occurred at the root of the horse tongue.

The aim of this investigation was to determine the pattern of movement of *G. intestinalis* and *G. pecorum* larvae in the oral cavity of the donkey.

MATERIAL AND METHODS

Larvae of *G. intestinalis* and *G. pecorum* were collected from 56 and 15 naturally infested donkeys, respectively. The donkeys were slaughtered at the National Circus, Giza governorate during one year (1987-1988). Infested heads were removed and the upper and lower jaws were sagittally separated. Lips, gingiva, cheeks, tongue, interdental spaces, soft plate, hard palate, epiglottis and pharynx were cut transversely in a series of 3-5 mm sections and examined for larvae or their tracks under a stereomicroscope. Larvae were identified according to Zumpt (1965). Tissues infested with *G. intestinalis* larvae were examined by scanning electron microscopy (SEM) as described by Cogley et al. (1982).

RESULTS

Gasterophilus intestinalis in the tongue:

Newly hatched 1st instars of *G. intestinalis* penetrated the anterior tongue margin, where they burrowed towards the free portion of the tongue dorsum (Fig. 1A). SEM showed that larval tunnelling behaviour and their pattern of movement in the tongue (Figure 2) was like that described and illustrated by Cogley et al. (1982), including the use of perpendicular air holes. When larvae reached the junction between the free and fixed portion of the tongue, they moved laterally to 3 cm of the vallate papillae (Fig. 1B). Distances between air holes were 3.3 ± 1.1 mm (Fig. 3A). All larvae found dispersing in the tongue were 1st instars, and none was found moulting. First instars showed gradual growth during their stay in the tongue (Table 1). The smallest larva was extracted

and the 2nd instar larvae in the upper part with their posterior segments visible externally. Interinstar 1 was found between these sites. No larvae were found in the interdental spaces of the incisors or canines. First instar larvae recovered from the interdental spaces were much larger than those recovered from the tongue (Table 1).

***Gasterophilus intestinalis* in the pharynx:**
Only 2nd instar larvae were found attached to the pharyngeal mucosa. These larvae were slightly larger than those found in the interdental spaces (Table 1).

***Gasterophilus pecorum* in the hard palate, cheeks and tongue:**

First instar larvae of *G. pecorum* penetrated the mucous membrane of the hard palate, the tongue and the cheeks. Larval penetration or dispersal

Table (1): Growth range and instars of *G. intestinalis* larvae within various phases of its life cycle.

| Phase | Larval instar | larval length (mm) | larval width (mm) |
|--------------------|-----------------|---------------------------|---------------------------|
| | | range (mean \pm S.E) | range (mean \pm S.E) |
| Tongue burrow | 1 st | 1.2 - 3.8 (2.7 \pm 0.7) | 0.2 - 0.7 (0.5 \pm 0.2) |
| | 1 st | 4.8 - 6.4 (5.8 \pm 0.5) | 0.6 - 1.2 (0.9 \pm 0.2) |
| Interdental spaces | interinstar 1 | 6.5 - 7.4 (6.8 \pm 0.5) | 0.9 - 1.4 (1.2 \pm 0.1) |
| | 2 nd | 6.5 - 7.9 (7.2 \pm 0.4) | 1.2 - 2.3 (1.7 \pm 0.4) |
| Pharynx | 2 nd | 6.7 - 8.3 (7.7 \pm 0.6) | 1.7 - 2.6 (2.0 \pm 0.5) |

Interinstar 1: First-instar in moulting process.
S.E.: Standard Error

from the anterior tongue margin (1.2 x 0.2 mm), and the largest (3.8 x 0.7 mm) was recovered from the posterior portion of the tongue.

***Gasterophilus intestinalis* in the interdental spaces:**

Larvae extracted from the interdental spaces included the 1st instar; the interinstar 1 (1st instar larva during moult) and the 2nd instar. Larvae were found in pockets between molar or premolar teeth and in gingiva of the upper arcade (Fig. 2B). They were arranged in a vertical position with the 1st instar larvae were found in the deepest part

ones were not observed in the gums and lips. Larvae in the hard palate and cheeks burrowed towards the soft palate (Fig. 3C), whereas those penetrating the tongue burrowed towards the root of the tongue (Fig. 3D). Burrowing behavior and air hole formation were similar to those described for *G. intestinalis* (Cogley et al., 1982). First instar larvae exhibited appreciable growth during their migration (Table 2). The smallest larva (1.1 x 0.2 mm) was recovered from the anterior part of the hard palate and tongue, and the largest larva (3.4 x 0.7 mm) was found at the posterior portion of the hard palate and the root of the tongue.

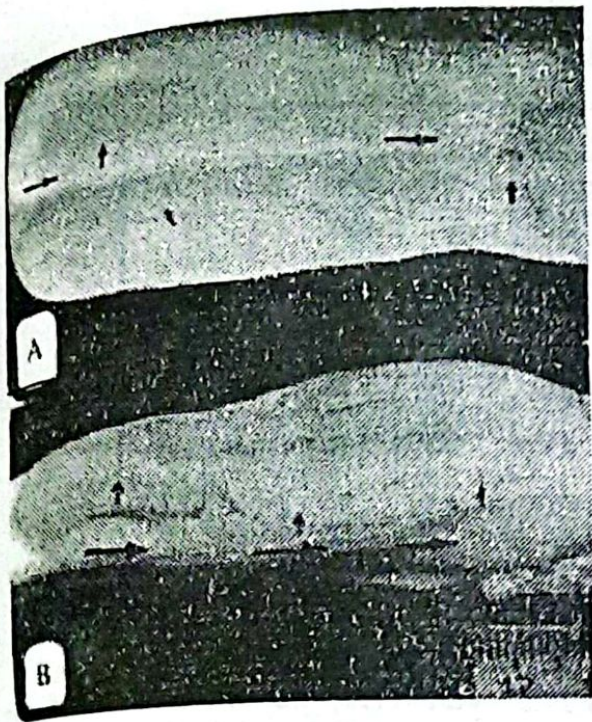


Fig. (1): Migration of *G. intestinalis* first instar larvae.
A) in the dorsal surface of the free portion of the tongue,
B) in the dorsal surface of the fixed portion of the tongue.

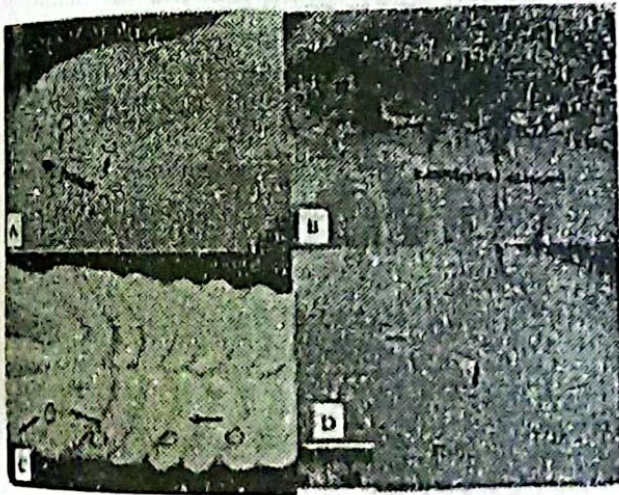


Fig.3: Larvae of *G. intestinalis* and *G. pecorum* infesting the oral cavity of donkey.
A) Air hole openings in the tongue infested with *G. intestinalis* first instar larvae.
B) *G. intestinalis* larvae infesting interdenal spaces between the molar teeth of upper arcade.
C) *G. pecorum* first instar larvae (circled) infesting the mucous membrane of the hard palate.
D) *G. pecorum* first instar larvae infesting the dorsal mucosa of the tongue.

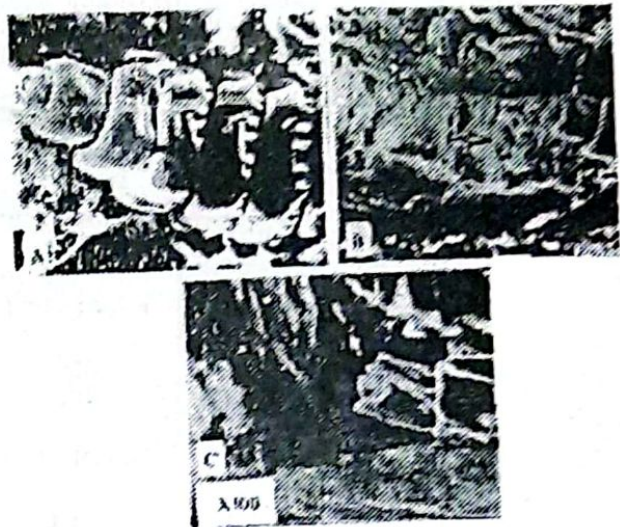


Fig. 2: Scanning electron micrograph of migrating *G. intestinalis* first instar larvae
A) The larvae embedding in the dorsal mucosa of the tongue.
B) The larva migrating in the tunnel.
C) The Larva arching their posterior stigmata upward into the air hole.

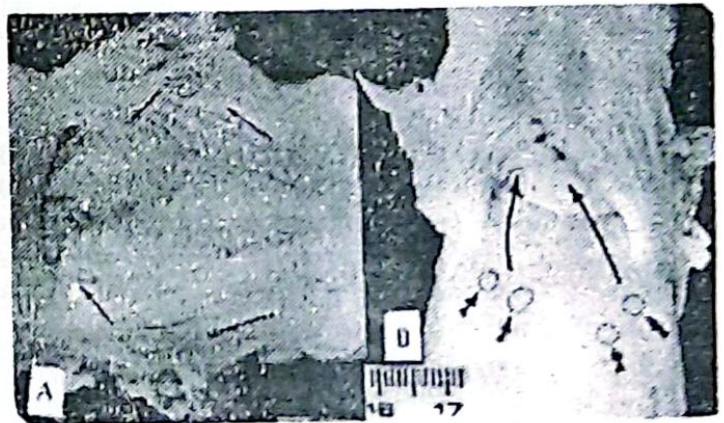


Fig. 4: Migration of *G. pecorum* larvae in the oral cavity
A) Freshly moulted second instar larvae at the lateral sides of the soft palate.
B) Freshly moulted second instar larvae at the root of the tongue after the vallate papillae.

Table (2): Growth range and instars of *G. intestinalis* larvae within various phases of its life cycle.

| Phase | Larval instar | larval length (mm) | larval width (mm) |
|--|---------------|----------------------------|---------------------------|
| | | range (mean \pm S.E) | range (mean \pm S.E) |
| Oral cavity burrow | 1st | 1.1 - 3.4 (2.2 \pm 0.8) | 0.4 - 0.7 (0.5 \pm 0.1) |
| Root of tongue and soft palate Pharynx | interinstar 1 | 3.3 - 5.8 (4.6 \pm 0.8) | 0.7 - 1.2 (0.9 \pm 0.2) |
| | 2nd | 5.6 - 7.2 (6.2 \pm 0.7) | 1.1 - 1.9 (1.5 \pm 0.3) |
| | 2nd | 6.7 - 8.3 (7.7 \pm 0.6) | 1.9 - 2.2 (2.0 \pm 0.0) |
| | Interinstar 2 | 7.2 - 8.9 (8.1 \pm 0.6) | 2.1 - 3.6 (2.3 \pm 0.2) |
| | 3rd | 8.6 - 11.2 (9.6 \pm 0.9) | 2.3 - 3.6 (3.0 \pm 0.4) |

Oral cavity burrow: Burrowing in hard palate, tongue and cheek.
 Interinstar 2 : Second instar in moulting process.

***Gasterophilus pecorum* in the soft palate and tongue root:**

Burrowing 1st instar larvae in the hard palate moved along the lateral sides of the soft palate, where interinstar 1 and 2nd instar larvae were extracted (Fig. 4A). Interinstar 1 and 2nd instar larvae also were found at the root of the tongue between the vallate papillae and roof of the pharynx (Fig. 4B).

***Gasterophilus pecorum* in the pharynx:**

Larvae recovered from the pharynx were the 2nd instar, interinstar 2 (2nd instar larvae during moult) and 3rd instar. Second instar larvae extracted from the pharynx were relatively larger than those from the soft palate and root of the tongue (Table 2).

DISCUSSION

Our results revealed that the behaviour and pattern of movement of *G. intestinalis* larvae in the donkey oral cavity were nearly identical to that reported in the horse by Cogley et al. (1982). The only minor differences were those in the donkey: (1) larvae burrowed in the lateral margin of the fixed portion of the tongue and never in the dorsal surface, (2) the distance between larval air holes

was 3.3 mm versus 4.2 mm in the horse, and (3) the most caudal part of the tongue where burrowed larvae were found was 3 cm to the vallate papillae versus 5 cm in the horse.

As reported by Dinulescu (1932) and Chereshev (1951), our study found that the 1st instars of *G. pecorum* penetrated the lips, gums and tongue, and that the 2nd instars attached to the soft palate and root of the tongue. The main differences were those in the donkey: (1) no signs of movement were observed in the lips and gums, (2) burrowing 1st instars in the hard palate and cheeks moved to the soft palate, and those burrowing in the tongue moved to the root of the tongue, (3) the first moult occurred in the soft palate and root of the tongue, and (4) second moult occurred in the pharynx.

REFERENCES

Alanis Tafolla, J.E. (1983): Occurrence of *Gasterophilus* larvae in horses slaughtered at Intapalapa, Mexico. *Veterinaria (Mexico)*, 14 (2): 114.
 Chereshev, N.A. (1951): Biological peculiarities of the botfly *Gasterophilus pecorum* Fabr. (Diptera: Gasterophilidae). (In Russian). *Doklady Akademii Nauk SSSR*, 77: 765-768.
 Dinulescu, G. (1932): Recherches sur la biologie des gasterophilus, anatomie, Physiologie, cycle evolutif. *Annales de Sciences Naturelles Zoologie Serie (10)* 15

- 1-83
Cogley, T.P.; Anderson, J.R.; and Cogley L.J. (1982): Migration of *Gasterophilus intestinalis* larvae (Diptera: Gasterophilidae) in equine oral cavity. *International J. for Parasitology*, 12 (5): 473-480.
- Abdali, M.; Derhalli, F.S.; and Baraka, A. (1987): Incidence and monthly prevalence of *Gasterophilus* spp. larvae (Diptera: Gasterophilidae) in the stomach of donkey (*Equus asinus*) in Egypt.. *Veterinary Parasitology*, 23: 297-305.
- Kilani, M.; Soussi, K.; Dorchies, P.; and France M. (1986): Epidemiological observation on Gasterophilidae of horses in the Tunis region (Tunisia). *Revue de medecine Veterinaire*, 137: 537-540.
- Rastegaev, Yu. M. (1984): The Fauna of nose flies and Stomach botflies (Diptera: Gasterophilidae) of Jack-asses, Asiatic wild asses and Mules in Turkman SSR. *Izvestiya Akademii Nauk Turkmenskoi SSR., Bioloich. Nauk*, No. 4: 67-69.
- Zumpt, F. (1965): *Myiasis in Man and Animals of the old world.. Butterworths, London: PP. 110-128.*