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REDESCRIPTION OF DEMODEX CABALLI
(= D. FOLLICULORUM VAR. EQUI RAILLIET, 1895)
FROM THE HORSE, EQUUS CABALLUS

BY

Clifford E. Desch, Jr. * and William B. Nutting **

ABSTRACT

The elongate hair follicle mite, Demodex caballi, of the horse is renamed, redescribed and figured for all stages in the life cycle. Some notes are provided on population structure including a sex ratio of 1:4.4, and on its distribution in the Meibomian (tarsal) gland complex. This species appears to be a low grade pathogen.

RÉSUMÉ

L’Acarien Demodicidae du cheval, Demodex caballi, est renommé et redécrit. Toutes ses stases sont figurées. Quelques données sont apportées sur la structure des populations (la sex-ratio est de 1:4,4) et sur la distribution dans les glandes cutanées tarsales. Cette espèce semble avoir un très faible rôle pathogène.

INTRODUCTION

Wilson (1844) first recorded an elongate demodicid, Entozenon (= Demodex) folliculorum, from the Meibomian glands of the horse. In 1895, Railliet referred to this mite as Demodex folliculorum var. equi. This designation was subsequently reduced to D. equi by Gmeiner (1908). The illustration and description in Hirist’s (1919) account of D. equi, however, apply to a short (190-232 μm) species. Bennison (1943) accepted this as D. equi and, in the same paper, described the elongate species as D. folliculorum var. equi. In all descriptions, the accounts of the life histories of these two species are incomplete.

We provide, below, a redescription and renaming of this elongate species, Demodex caballi, with notes on its life cycle, locus in the skin complex and population structure.

MATERIALS AND METHODS

Mites were expressed from the Meibomian glands by pressure applied with the blunt end of a scalpel handle, mounted in Hoyer’s medium and examined with phase contrast microscopy.

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Eyelid tissues were fixed in 10% formalin, embedded in paraffin-piccolyte (Cloney, 1961), sectioned at 10 μm and stained with Ehrlich's hematoxylin and eosin Y.

**Redescription**

*Demodex caballi* is a large member of the genus, the longest specimen, a male, measuring 445 μm. All measurements below are given in micrometers.

**Male** (Fig. 1): Mean body length 414.7 with opisthosoma comprising 3/4 of this value. Other measurements in Table I.

Gnathosoma trapezoidal, length less than basal width. Subgnathosomal setae (pits) minute; lateral to horseshoe-shaped pharyngeal bulb (pump) (Text-fig. 1). Supracoxal spines peg-like and reflexed posteriorly (Text-fig. 2); partially embedded in gnathosomal cuticle and spaced 18-20 apart. Palpal tarsus with 3 minute spines; two double tined and one single tined.

**Table I.** — Means and standard deviations for 20 specimens of each stage and sex of *Demodex caballi*. All measurements in micrometers.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gnathosoma:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>21.0 ± 0.9</td>
<td>22.1 ± 1.2</td>
</tr>
<tr>
<td>Width</td>
<td>29.9 ± 1.4</td>
<td>32.0 ± 0.8</td>
</tr>
<tr>
<td>Podosoma:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>87.1 ± 2.5</td>
<td>91.5 ± 2.7</td>
</tr>
<tr>
<td>Width</td>
<td>50.1 ± 4.1</td>
<td>53.0 ± 2.7</td>
</tr>
<tr>
<td>Opisthosoma:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>305.9 ± 22.5</td>
<td>239.4 ± 18.7</td>
</tr>
<tr>
<td>Width</td>
<td>39.4 ± 3.7</td>
<td>40.8 ± 1.0</td>
</tr>
<tr>
<td>Total length</td>
<td>414.7 ± 23.4</td>
<td>352.5 ± 17.6</td>
</tr>
<tr>
<td>Aedeagus</td>
<td>22.1 ± 1.1</td>
<td></td>
</tr>
<tr>
<td>Vulva</td>
<td>9.0 ± 0.5</td>
<td></td>
</tr>
</tbody>
</table>

Genital orifice dorsal; a narrow, 10 long longitudinal slit in an oval protuberance at anterior level of legs II (Text-fig. 3). Anterior pair of dorsal podosomal tubercles spaced 30 apart at
level of legs I; posterior pair 27 apart at level of legs II but behind genital slit. Aedeagus 22.1 long.

Opisthosoma transversely striated and tapered to a blunt point. Opisthosomal organ (= proctodeum of Desch et al., 1970) absent.

**Female** (Fig. 2): Mean body length 352.5 with opisthosoma comprising 7/10 of this value. Gnathosoma and associated structures similar to males, but average length and width about 2 greater.

Legs and coxal plates as in male. Dorsal podosomal tubercles present and positioned as in male.

Vulva a longitudinal slit, 9 long, within an oval area 5 behind the posterior margins of coxal plates IV (Text-fig. 4).

Opisthosomal striae and terminus as in male. Opisthosomal organ absent.

**Ovum** (Fig. 3): Ellipsoid, 103.4 long and 36.5 wide.

**Larva** (Fig. 4): Elongate, 161.2 long and 33.3 wide.

Gnathosoma as in adult except subgnathosomal setae absent.

Three leg pairs project from lateral body wall; distal end of each with single trifid claw. Solenidion dorsal to claw on legs I and II. Leg segmentation and sternal scutes not apparent.

**Protonymph** (Fig. 5): Overall body configuration and gnathosomal structures similar to larva; 222.2 long. Each leg with a pair of trifid claws. Two pairs of sternal scutes at level of legs II and III; appear crescent-shaped in ventral view and mamma-like in lateral view.

**Nymph** (Fig. 6): Overall body configuration and gnathosomal structures similar to larva; 317.8 long. Four leg pairs each with a pair of trifid claws. Three pairs of sternal scutes at level of legs II, III and IV; shaped as in protonymph.
Diagnosis: *Demodex caballi* most closely resembles *D. cati* Hirst, 1919 of the cat, *Felis domestica*. The following characters serve to differentiate these demodicids (all *D. cati* measurements from DESCH and NUTTING, unpublished data).

1. *Demodex caballi* females longer (352.5 ± 17.6 μm) than *D. cati* females (219.0 ± 27.4 μm).
2. *Demodex caballi* males longer than females; *D. cati* females longer than males.
3. Opisthosomal organ absent in *D. caballi*; present in both sexes of *D. cati*.

*Demodex caballi* vs. *Demodex equi*:

1. *Demodex caballi* reported only from eyelids and muzzle; *D. equi* on other areas except eyelids and muzzel (BENNISON, 1943).
2. *Demodex caballi* males longer than females (385-460 μm; 20 specimens vs. 325-396 μm, 20 specimens); *D. equi* females longer than males (200-236 μm, 20 specimens vs. 179-207 μm, 12 specimens (HIRST, 1919; BENNISON, 1943)).
3. Opisthosoma comprises more than half the total body length in *D. caballi* (68-74 %) but less than half the total length in *D. equi* (37-42 %).

A provisional key to medical-veterinary demodicid species, including the above, is found in NUTTING, 1976.

**Population structure**: Examination of 1025 specimens of *Demodex caballi* obtained from the upper and lower eyelids of four hosts revealed a population of 54 ova (= 5 %), 25 larvae (= 2 %), 38 protonymphs (= 4 %), 71 nymphs (= 7 %) and 837 adults (= 82 %), (154 males = 15 %, 683 females = 67 %). These values give the following ratios: ovum to females 1 : 12 .6; immature (excluding ova) to adults 1 : 6 .2; and male to females 1 : 4 .4.

**Habitat**: The Meibomian glands in the horse measure 7 mm long by 1 mm in diameter and lie perpendicular to the inner edge of the eyelids. A large central canal is present which opens just within the inner margin of the lid. Most mites are situated in secondary canals measuring slightly in excess of their own width (Fig. 7). The mites generally have a solitary distribution within the various acini, but may occupy acini in all levels of the gland. Habitat modification by *Demodex caballi* appears minimal and no marked pathological condition was noted as a result of their presence (Fig. 8).

In addition to the Meibomian gland locus, BENNISON (1943) reported this elongate demodicid from the muzzle in 3.6 % of the horses he examined (2 of 56). BENNISON noted that the mites were found also in the eyelids. In another series of eyelid examinations he found 17 parasitized by this mite species out of 132 horses examined.

**Type specimens**: Slide # 48 in the collection of W. B. Nutting contains neotype and other specimens. Slides containing a similar series of specimens will be sent to the National Museum of Natural History, Washington, D. C., the Acarology Laboratory, Columbus, Ohio and the British Museum (Natural History), London, England.

**Host**: *Equus caballus*.

**Discussion**

This account, although providing a complete description of all life stages of *Demodex caballi*, separates, on taxonomic and host topologic grounds, only the adults of this species from *D. equi*. Immatures and ova of *D. equi* have not been described.
FIG. 1-6. — *Demodex caballi* life cycle. × 190.

1) Male; 2) Female; 3) Advanced embryo in egg shell; 4) Larva; 5) Protonymph; 6) Nymph.

FIG. 7. — Mites (M) *in situ* in secondary ducts of lower lid Meibomian glands. Mite indicated with an asterisk shown in Fig. 8. × 100.

Bennison (1943) examined sections of eyelid and muzzle tissues containing *Demodex caballi* (his *D. folliculorum* var. *equi*) and noted that:

1. Cells of the Meibomian glands appear to have been displaced possibly by mite ingestion of cell contents.
2. Cyst-like encapsulations of some mites were noted in the Meibomian glands.
3. Inflammatory reactions were absent in both muzzle and Meibomian glands.

Our observations confirm the displacement of gland cells as noted by Bennison, however, this may be due, in part, to cell division and growth around the mite bodies as well as mite ingestion. In our study no other cellular derangements or associated inflammatory responses were noted in or around the infested glands. *Demodex caballi*, therefore, appears to be a low grade pathogen.

**Acknowledgment**

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**Literature Cited**


