Egypt. J. Agric. Res., 77 (2), 1999.

MORPHOLOGICAL STUDIES ON SOME PARASITES INFECTING HEDGEHOGS (*HEMIECHINUS AURITUS*) IN EGYPT

MAGDA A.H. EL-REFAII

Animal Health Research Institute, Agricultural Research, Centre, Giza, Egypt.

(Manuscript received 21 June 1998)

Abstract

Morphological studies were carried out on 8 hedgehogs captured from desert areas. They were parasitologically examined. External examination revealed no infection with external parasites. After sacrifaction, microscopical examination of blood and organ smears were refractory to any blood parasite. Examination of the mesentery and intestines revealed different species of parasites. Five hedgehogs were found infected with the acanthocephala *Prothenorchis elegans* and *Moniliformis moniliformis*. One animal carried the nematode worm Gongylonema spp. larvae; each one was enclosed in a cyst. Two hedgehogs had an infection with the nematode *Rictularia* spp. All recovered parasites were thoroughly identified and illustrated, some of them were discussed from the zoonotic point of view.

INTRODUCTION

The order insectivora includes a number of species among which are hedgehogs, that are popular with the hobbyists as exotic pets, because of their small size and interesting feeding habits. Likewise, hedgehogs are useful laboratory animals. These animals are nocturnal in habit and feed on insects and small vertebrates (Wallach and Boever, 1983). Insects, such as beetles or cockroaches, may act as intermediate hosts for various species of parasites (Genov and Bily, 1980). Thus, hedgehogs, in turn, when feeding on such insects may be sources for any parasite that these insects can harbour its larval stage (Okaeme and Osakwe, 1980).

Detailed studies concerning parasites infesting hedgehogs are scarce. Therefore, the present study was devoted to give a spot light on such parasites.

MATERIALS AND METHODS

Eight alive hedgehogs (Hemiechinus auritus) were captured from desert areas at El-Hamam in Marsa Matrouh and Abou-Rawash in Giza governorates on different occasions. They were externally examined, then, sacrificed and post-mortem examination was carried out.

Blood films were prepared and stained with Giemsa stain and examined for any blood parasite. The internal organs such as the liver, the spleen, the heart and the lungs were sectioned in physiological saline and examined under a binocular dissecting microscope. Impression smears from the spleen were stained with Giemsa. The mesentery, intestines and stomach were dissected and cut-opened in saline. The intestines were divided to duodenum, ileum and jejunum. Their contents were collected, washed and examined under a binocular dissecting microscope. The wall of the intestines, stomach and the mesentery was examined for the presence of any cyst. In case of presence of any worm, it was thoroughly washed with saline, identified, measured and then freshly illustrated. The uterus of the female worms was teased out and the released eggs were measured and described. Some worms were mounted and stained with carmine (Desowitz, 1980). The recovered worms were identified according to Baylis (1925) and Yamaguti (1961 and 1963).

RESULTS

Examination of the eight hedgehogs revealed no infection with any external parasite. After sacrifaction, blood and organ smears were also refractory for any blood parasite. The mesentery, small and large intestines were occupied with different species of parasites. Five hedgehogs were found infected with 2 species of Acanthocephala. The first one was *Prothenorchis elegans*, genus, *Prothenorchis*, sub-family, *Prothenorchiinae*, family. *Oligacanthorhynchidae* and order, *Gigantorhynchidea*. The second one was *Moniliformis moniliformis*, genus, *Moniliformis*, family, *Moniliformidae* and order, *Gigantorhynchidea*. Three hedgehogs were found infected with 2 species of nematodes. One animal carried *Gongylonema* spp. larvae, genus, *Gongylonema*, sub-family, *Gongylonematinae*, family, *Spiruridae* and order, *Spiruridea*. Each larva was enclosed in a hyaline cyst; some cysts were scattered allover the mesentery. The two other hedgehogs had an infection with *Rictularia* spp. Genus, *Rictularia*, Family, *Rictulariidae* and order, *Spiruridea*.

Prothenorchis elegans worms were detected in the jejunum which was very congested (Fig 1). The proboscis and anterior part of the neck were enclosed in a

thick capsule. The female worm measured 2.5 cm long, cylindrical, curved ventrally and transversally segmented. A clear somewhat long neck was noticed. The globular proboscis was armed with 5 transverse rows of stout hooks, the roots of which were protruded anteriorly. The proboscis receptacle seemed to be short. Lemnisci appeared long and slender. The posterior extremity of the female worm showed a vagina terminating about 125 µm from the posterior end. The uterus, characterized by a bell, showed 2 very prominent lateral diverticula (Fig 2). When the uterus was teased out in saline solution, the eggs were released, each one measured 82-83 X 44-52 µm, barrel-shaped, thick-shelled with a developing embryo (the acanthor) showing hooks (Fig 3). The shell consisted of 3 layers, the middle one only appeared to be not complete at both poles. In front of the future head of the acanthor, there appeared a crescentic-shaped cap indicating the site of hatching.

The second species of Acanthocephala, *M.moniliformis*, was found located in the first part of the duodenum surrounded by fibrous tissue. The duodenum was congested. After being recovered, the worm was creamy-white in colour, measuring 8.5-9 cm long, provided with external pseudosegmentations. The retractile proboscis was claviform, armed with numerous small hooks arranged in 12 spiral rows. Each hook was provided with a backwardly directed root (Fig 4a). The proboscis receptacle was comparatively short and covered with spiral muscles. Near the receptacle base, there were 4 ganglia. The lemnisci were filiform and long (Fig 4b). The posterior end of the female worm showed a sac-like uterus full of eggs and the vagina (Fig 4c). When the uterus was teased out in saline, the eggs were released. Each egg, enclosing the acanthor, was oval in shape with concentric membranes, but without strong shell. The egg measured 75 x 32 µm (Fig 4d).

Regarding nematodes, adult worms, *Rictularia spp.* were detected in small and large intestines. Each worm carried two rows of 32 pairs of subventral different shaped spines; there were comb-like spines each of which measured 99 x 42.9 µm and occupied the anterior third of the body (Fig. 5a), while, in the middle and posterior thirds there appeared individual spines directed backwards and measured 49.5 x 9.9 µm. There was a cuticular transparent sheath enclosing these spines (Fig 5b). The mouth being subterminal, opened by a transverse elongated aperture bordered by 2 pairs of denticles, the buccal capsule was well chitinized and armed at its base with a pair of prominent teeth. The oesophagus was simple, slightly claviform and measured 1.57 mm long. There were two cervical alae extending from the mouth region till the middle of anterior third of oesophagus (Fig. 6). The male was 4.25 mm long terminating with a conical thumb-like tail and provided with a

small ala. There were 2 V-shaped short unequal spicules, each of which was supported by a gubernaculum. Anterior to these spicules, there were 4 prominent protrusable oval sensitive papillae. There was a single tubular testis (Fig. 7). Concerning the female, it measured 10-11 mm long and 250 um wide. The tail was conical and pointed (Fig 8a). The vulva was located at 2-4 mm from the anterior end and has a conspicuous projecting appendage (Fig 8b). When the uterus was teased out in saline solution, the eggs were released. Each egg was oval, thin-shelled, occupied by one cell embryo and measured 35.2 x 24.2 µm (Fig. 8c).

By examination of the mesentery, small pin-headed hyaline cysts were observed. When compressing one of them, a larval stage of a nematode was released (Fig. 9a). This was recovered and microscopically identified as a larval stage of *Gongylonema* spp. It measured 4.5 mm long. Its entire body was marked by transverse striations. There were fine tubercles characteristic of the species arranged in longitudinal rows. Figure 9b showed that the mouth was surrounded by a funnel-shaped cuticular rim. There were 2 pairs of minute cephalic papillae. At a very short distance from the mouth, there was a pair of structures termed semilunar depressions. Figure 9c showed that the mouth led to a narrow short pharynx, followed by a relatively short and narrow anterior muscular portion of the oesophagus. This portion was surrounded, near its posterior end by a nerve ring at a distance of 0.2 mm from the anterior extremity. The possterior portion of the oesophagus was much longer than the anterior one. At a distance from the anterior extremity of the worm, there was a lateral cervical papilla, and a cervical ala was present. Figure 9d showed that the excretory pore was situated near the posterior end of the oesophagus. Regarding the posterior end of the future female, there was a slightly prominent vulva situated at 187.5 µm from the posterior end (Fig. 9e). Figure 9f showed a spherical swelling which may be the peduncle of one or more papilla of the future male.

DISCUSSION

The present study revealed the presence of different parasites inhabiting hedgehogs; two of them were related to *Acanthocephala* and the other two to nematodes. *Acanthocephala* were *P.elegans* and *M.moniliformis*. They were identical to those described by Yamaguti (1963). Roubal (1993) found the proboscis and the anterior part of the neck of *Acanthocephala* enclosed in a capsule of proliferative connective tissue in spleen and gut wall of Pisces. This was similar to that found in this study, where, the proboscis of *Prothenorchis* was surrounded by a capsule;

many capsules were found scattered allover the jejunum. Flynn (1973) stated that *P.elegans* is the highly pathogenic intestinal parasites of the American monkeys because cockroach, the intermediate host, is common in primate cages. In Egypt, Omar and Bakr (1993) described *M.moniliformis* isolated from hedgehogs. Also, Oetinger (1995) removed the same Acanthocephalan from the greater omentum of a rat, where the worm was enclosed in a host connective tissue tunnel. This was similar to that found in this study as *M.moniliformis* was found surrounded by fibrous tissue in the duodenum. Neafie and Marty (1993) recorded a human case of *M.moniliformis*. Thus, *Moniliformis,* from the zoonotic point of view, can be transmitted from hedgehogs to man, a fact which must be looked for.

Regarding *Gongylonema* spp. larva, it was identified after Baylis (1925). The adult worm inhabits the oesophagus of mammals such as sheep, goat, cattle and also man. The larva of this parasite had been found by Alicata (1935) embedded in the wall of gastroesophageal region of a guinea-pig. He suggested that the larvae excyst in the stomach and then migrate anteriorly to the wall of oesophagus. Such case is that which has been detected in the mesentery in this study as *Gongylonema* spp. Larvae were found in hyaline cysts scattered allover the mesentery. Concerning the spherical swelling found in the posterior extremity of the future male, Seurat (1916) observed a similar enormous swelling, and stated that it was the peduncle of one or more of the papillae. The imporatance of *Gongylonema* lies in the fact that it is a zoonotic parasite, so, hedgehogs can be a source of transmitting this parasite to man. The presence of this parasite in human beings may interfere with the deglutition process (El-Rafaii and Michael 1991).

The other nematode, *Rictularia spp.* was identified after Yamaguti (1961). From the available literature, this parasite had been discovered by Will-Suhm (1869) in fox and hedgehogs in Egypt. Up till now, it is not sure whether this parasite could be transmitted to man. Semenova (1971) described *Rictularia volgensis* found in the intestine of hamester. It was 2.912 mm long with unequal spicules, the number of cuticular combs were 40 per row and the pre-anal cuticular projections were 6, the oral capsule was armed with 6 denticles and 3 large bicuspid teeth.

From the previous results it is concluded that, due to the natural habit of hedgehogs to prey insects, they can be liable to be inhabited by variable species of parasites. Thus, hedgehogs could be a source of infecting other hosts with parasites even man who sometimes prefer keeping hedgehogs in houses, consequently, they facilitate the dissemination of a particular parasite.

REFERENCES

1. Alicata, J.E., 1935. Early developmental stages of nematodes occurring in swine. US Dept. Agric. Tech. Bull., 489.

2. Baylis, H.A. 1925. On the species of Gongylonema (nematode) parasitic in ruminants. J. Comp. Path. Ther., 38 (1): 46-55.

3. Desowitz, R.S. 1980. Ova and parasites: Medical parasitology for the laboratory technologist. Harper and Row (publishers), London, Mexico city, Sao Paulo, Sydney, New York, Cambridge and Philadelphia.

4. El-Refaii, A.H. and S.A. Michael. 1991. On *Gongylonema pulchrum* Molin, 1857 recovered from sheep and goats in Egypt. 1st. Sci, scientific cong., Egypt. Soci. cattle dis., 1-3 Dec. Assiut, Egypt.

5. Flynn, R.J. 1973. Parasites of laboratory animals. 1st ed. Iowa State University Press. Ames, Iowa.

6. Genov, T. and S. Bily. 1980. Beetles as intermediate hosts of helminths from various types of pasture in Bulgaria. Khelmintologiya, 9: 26-32.

7. Neafie, R.C. and A.M. Marty. 1993. Unusual infections in humans. Clinical Microbiology Reviews, 6 (1): 34-56.

8. Oetinger, D.F. 1995. Ectopic *Moniliformis moniliformis* from a laboratory infected rat, *Rattus norvegicus*. J. Helminth. Soc., Washington, 62 (1): 98-102.

9. Okaeme, A.N. and M.E. Osakwe. 1988. Gastro-intestinal helminths and food of the African hedgehog *Atelexia albiventris* (Wagna) in the Kainji lake area of Nigeria. African J. Ecol., 26 (3): 239-241.

10. Omar, H.M. and M.E. Bakr. 1993. Role of wild small mammals in disseminatin two helminth parasites transmissible to man. Egypt. J. Med. Sci., 14 (1): 1-4.

11. Roubal, F.R. 1993. Comparative histopathology of Longicollum (*Acanthocephala: Pomphorhynchidae*) infection in the alimentary tract and spleen of *Acanthopagrus australis* (Pisces: Sparidae). Inter. J. Parasit., 23 (3): 391-397.

12. Semenova, N.N. 1971. On the helminth fauna of rodents in the Volga area. Materialy nauchnyph konferentsii vsesoyuznozo obsshchestva gelmintologov, 22: 21-223.

13. Seurat, L.G. 1916. Sur les Gongylonemes du Nord-Africain. Compt. Rend. Soc. Biol., Paris, Vol. LXXIX., pp. 717-742.

14. Wallach, J. D. and W.J. Boever. 1983. Diseases of exotic animals, medical and surgical management. W.B. Saunders Company. Philadelphia, London. Toronto, Mexico city, Rio de Janiero, Sydney and Tokyo.

15. Will-Suhm. 1861. Cited by Yamaguti. 1961.

16. Yamaguti, S. 1961. Systema helminthum. The nematodes of vertebrates. Intersscience Publishers L.T.D., London.

17. Yamaguti, S. 1963. Systema helminthum. Volume V Acanthocephala. Interscience Publishers, New York, London.

EXPLANATION OF FIGURES

Fig. 1: Anterior part of *P.elegans* after mounting (p.proboscis, Pr. proboscis receptacle, L. lemniscus) x 50.

Fig. 2 : Posterior part of *P.elegans* after mounting (Un.uterine bell, Dv. Diverticula, V. vagina) x 50.

Fig. 3 : Fresh *P.elegans* eggs x 500.

Fig.4 : (a and b) Anterior part of *M.moniliformis* after preservation (P. proboscis, Pr. Proboscis receptacle, L. lemniscus, G. ganglia) 4a x 125 and 4b x 50.

(c) Prosterior part of M.moniliformis after preservation (U. uterus, V. vagina) x 50.

(d) Fresh M.moniliformis egg x 500.

Fig. 5 (a and b) Rictularia spp. spine x 500.

Fig. 6: Fresh anterior part of Rictularia spp. (D. denticle, T. tooth Ca. Cervical alla, Oe. oesophagus) x 500.

Fig. 7 : Fresh posterior part of Rictularia spp. male (Se. sensitive papillae, Gu. gubernaculum, Sp. spicule. A. ala) x 125.

Fig. 8: (a) Fresh posterior part of Rictularia spp. female x 125.

(b) Vulva of female *Rictularia* showing a projecting appendage x 125.

(c) Fresh eggs of *Rictularia* spp. x 500.

Fig. 9: (a) Fresh *Gongylonema* spp., larva (Tu. tubercles, Ts. Transverse striations) x 50.

(b, c and d) Fresh anterior end of *Gongylonema* spp. larva (Cr. Cuticular rim, Ce. Cephalic papillae, Sd. semilunar depression, Oe. Oesophagus, N. nerve ring, Cp. cervical papilla, Ca. cervical ala, E.excretory pore) 9b x 500, 9c x 125 and 9d x 50.

(e) Fresh posterior end of female *Gongylonema* spp. x 125.

(f) Fresh posterior end of male *Gongylonema* spp. x 500.

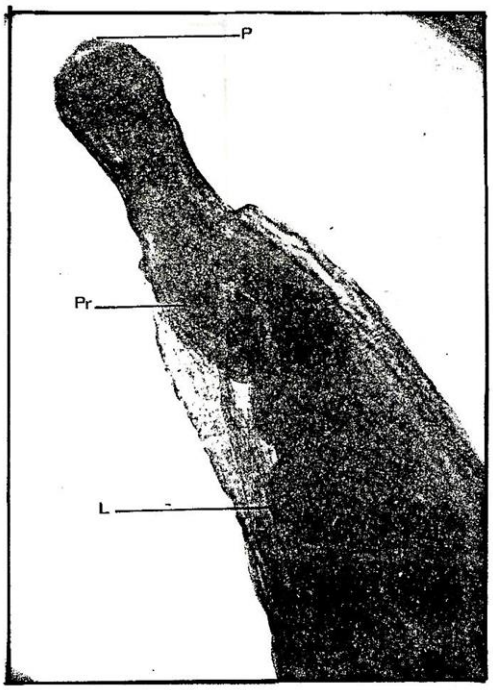

Fig. 1.

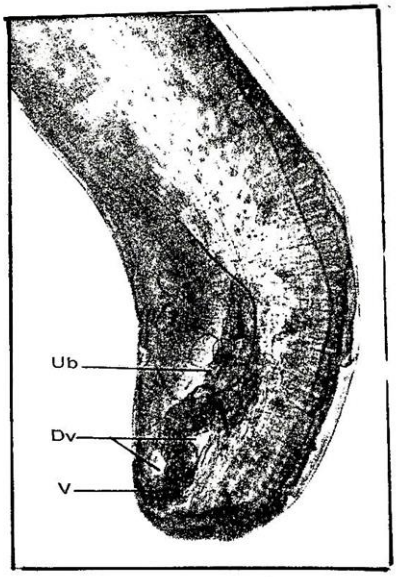

Fig. 2.

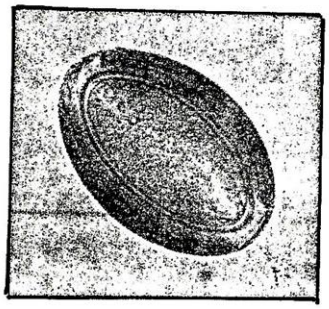

Fig. 3.

Fig. 4a.

Fig. 4b.

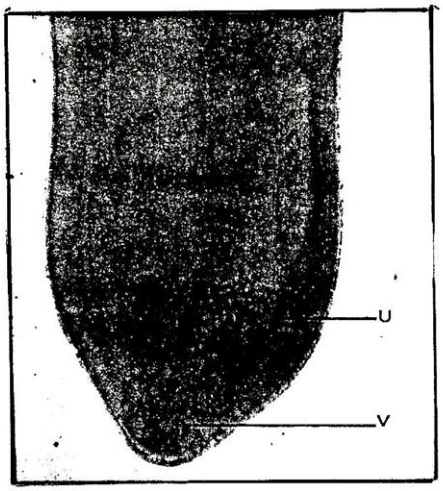

Fig. 4c.

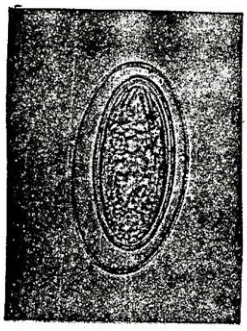

Fig. 4d.

Fig. 5a.

Fig. 5b.

Fig. 6.

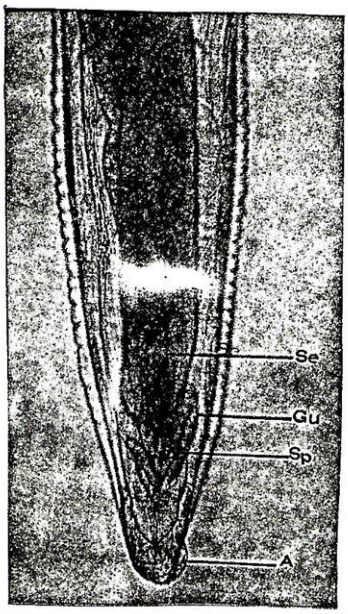

Fig. 7.

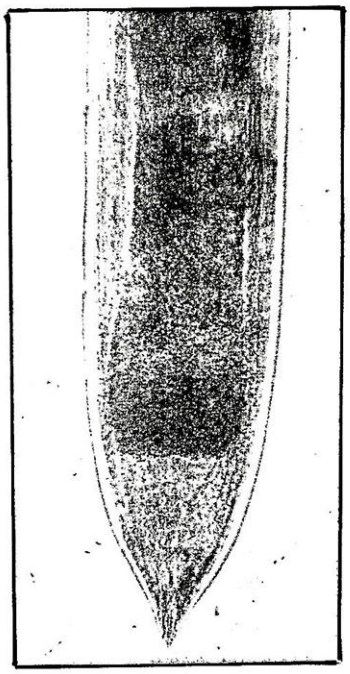

Fig. 8a.

Fig. 8b.

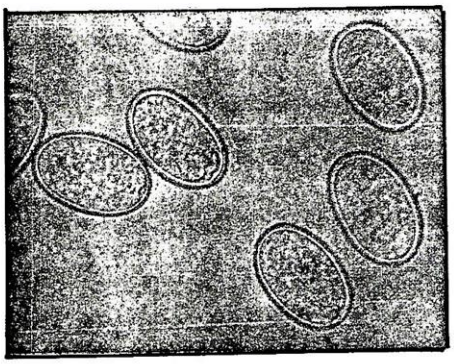

Fig. 8c.

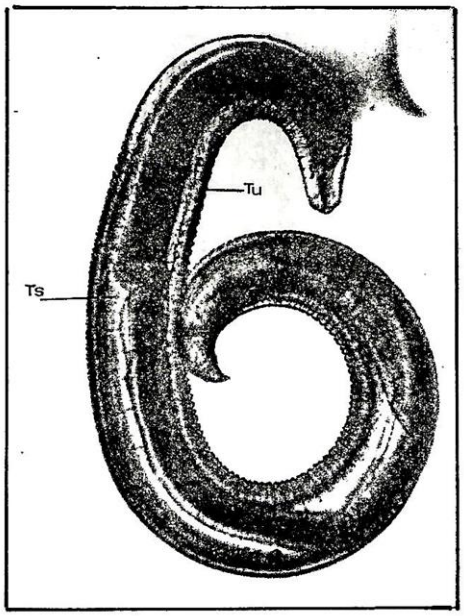

Fig. 9a.

Fig. 9b.

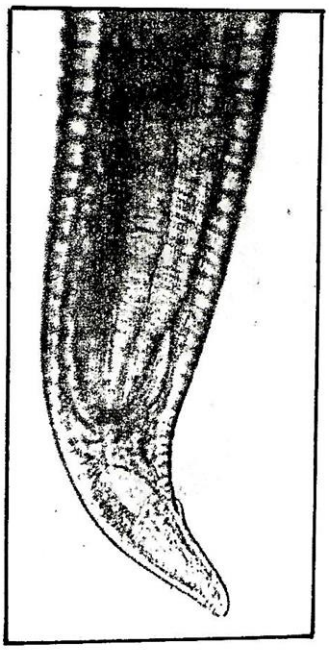

Fig. 9c.

Fig. 9d.

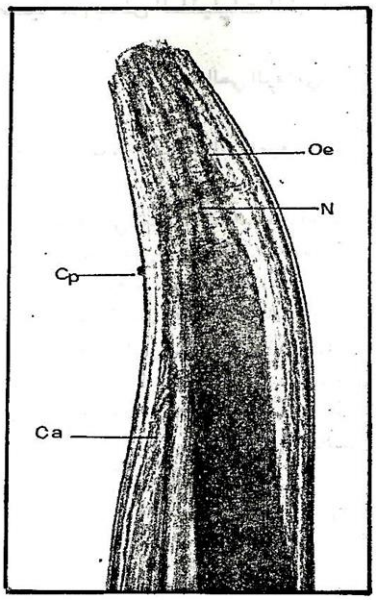

Fig. 9e.

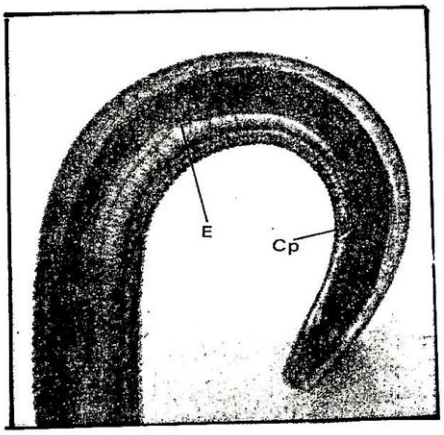

Fig. 9f.

دراسات وصفية عن بعض الطفيليات التي تصيب القنافذ بمصر

ماجدة عبد الحي الرفاعي

معهد بحوث صحة الحيوان – مركز البحوث الزراعيه – الدقى – جيزة – مصر .

تم إجراء هذه الدراسة علي ثمانية قناقذ حية تم صيدها من مناطق صحراوية مختلفة. أجريت دراسات طفيلية علي هذه القنافذ. بالفحص الظاهري تبين عدم إصابة هذه الحيوانات بالطفيليات الخارجية. تم ذبح هذه القنافذ واخذ منها عينات دم ومسحات من الأعضاء الداخلية المختلفة، بعد الفحص كانت جميعها سلبية للطفيليات الدموية.

عند فحص الأمعاء والغشاء البريتوني تبين أصابتها بأنواع مختلفة من الطفيليات، خمسة قنافذ كانت مصابة ببروثنركيس إليجانس ومونيليفورمس مونيليفورمس، وقنفذ واحد كان مصابا بيرقات جونجولونيما كما ثبتت إصابة قنقذين بطفيل ديكتيولاريا. تم توصيف هذه الطفيليات بالتفصيل مع تصويرها ومناقشة أهمية بعضها من ناحية الصحة العامة.