DETECTION OF DEVELOPMENTAL STAGES OF SOME CAMEL PARASITES TRANSMITTED BY TICKS

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Abstract

Forty-five *Hyalomma dromedarii* and 27 *Ornithodoros savignyi* adult ticks were collected from slaughtered camels. Smears from gut, salivary glands, haemolymph, and blood were prepared and stained with Giemsa stain. Leptomonas form of Trypanosoma was seen in 3 salivary glands and 4 blood smears of *O. savignyi* and in salivary glands and gut smears of 6 *H. dromedarii* individuals. Sheathed Microfilariae were seen in 3 blood smears of *O. savignyi* and in 9 salivary glands, 9 guts, and 6 blood smears of *H. dromedarii*. As well, different stages of *Hepatozoon* were seen in 3 guts and 12 haemolymph smears of *H. dromedarii*. The importance of these ticks as vectors of mentioned parasite stages is discussed.

INTRODUCTION

Ticks are ectoparasites that infect various animal species. They are known to be vectors for many pathogens. *H. dromedarii* was known to transmit *Theileria camelensis* to camels (El-Refaii *et al.*, 1998). *Rhipicephalus sanguineus* was found to be an effective vector of *Hepatozoon canis* (Inokuma *et al.*, 1998). *Hepatozoon spp.* constituted a group of apicomplexan parasites that primarily infected leukocytes of mammals and erythrocytes of amphibians, reptiles and birds, which could act as intermediate hosts, while, the definitive hosts were hematophagous invertebrates. Symptoms of such infection were mostly found in young animals or adult ones, which suffered from immunodeficient conditions (Craig, 1998).

As well, *Rhipicephalus sanguineus* was recorded to transmit the microfilariae of *Dipetalonema dracunculoides* to dogs (Olmeda-Garcia *et al.*, 1993). The predilection sites of Microfilariae of genus *Dipetalonema* (syn. *Acanthocheilonema*) differed according to the host. *Dipetalonema evansi* that infected camels was found in the pulmonary and spermatic arteries and in lymph nodes causing parasitic orchitis or aneurysms in

the spermatic vessels, or arteriosclerosis and heart insufficiency in infected camels (Soulsby, 1986). As well, El-Kady (1998) found Trypanosoma in *Hyalomma spp.* infecting camels.

Due to the economic importance of camels in the last decade, camels became one of the most important sources of meat production. As *Hyalomma dromedarii* and *Ornithodoros savignyi* parasitize camels, therefore, the present study was devoted to give a spot light on some parasitic stages concomitant with such ticks.

MATERIALS AND METHODS

A total of 45 adult ticks of the species *Hyalomma dromedarii* and 27 ones of the species *Ornithodoros savignyi* were collected separately on different occasions from camels subjected to slaughter in El-Bassatine abattoir in Cairo. Ticks were identified according to Hoogstraal (1956). Each tick individual was dissected; smears from gut, salivary glands, haemolymph and blood (if engorged) were taken separately. They were stained with Giemsa stain. Dimensions of detected developmental stages of the parasites were determined by using ocular micrometer.

RESULTS

Smears from gut, salivary glands, haemolymph and blood from 45 and 27 individuals of *O. savignyi* and *H. dromedarii* respectively were examined. Three salivary gland smears and 4 blood smears from *O. savignyi* revealed the presence of leptomonas form of *Trypanosoma evansi* which measured 4.38 x 0.5 µm (Fig. 1). Also, there appeared sheathed Microfilariae which measured 56.25 x 1.25 µm in blood smears of 3 tick individuals (Fig. 2), while, gut and haemolymph smears were refractory.

Concerning *H. dromedarii*, salivary glands and gut smears revealed the presence of leptomonas form of Trypanosoma. It was characterized by the kinetoplast and axoneme being at the anterior tip of the body, and had no undulating membrane and measured 4.5 x 0.5 µm in 6 individuals, as well as, the presence of sheathed Microfilariae which measured 61.3 x 1.56 µm in 9 salivary glands, 9 guts and 6 blood smears.

An outstanding feature was the presence of a cephalic space in some Microfilari-

ae and the presence of a number of nuclei in irregular rows extending to the end of blunty round tail (Fig. 3).

In addition, different developmental stages of *Hepatozoon spp.* were detected in 3 guts and 12 haemolymph smears. In haemolymph smears, macrogamete and microgamete were lodged within a parasitophorous vacuole and measured 4.38 µm and 2.5 µm, respectively, as well as, a binucleated structure interpreted to be syngamy and measured 2.5 µm was seen (Fig. 4). Also, different stages of zygote were detected. An early formed zygote with 2 nuclei on the periphery, measured 4.38 x 3.75 µm was seen, and a more advanced stage of zygote in which several darkly stained nucleoli were seen and measured 10 µm (Fig. 5). The oocyst was spherical to oval, measured 8.75 – 21.25 x 8.75 – 25 µm and contained numerous sporocysts which appeared as blue dots, such oocysts were detected in gut and haemolymph smears (Fig. 6).

DISCUSSION

This study was conducted on adult ticks of the species *Ornithodoros savignyi* and *Hyalomma dromedarii* that parasitize camels. Examination of smears from gut, salivary glands, haemolymph, and blood from both species revealed the presence of developmental stages of some parasites that could be transmitted to camels through these ticks.

The leptomonas form of *Trypanosoma evansi* was encountered in the salivary glands and blood smears of *Ornithodoros*, and measured 4.38 x 0.5 µm, also, in salivary glands and gut smears of *Hyalomma* and measured 4.5 x 0.5 µm.

In Egypt, El-Kady (1998), recorded Trypanosoma in the gut and haemolymph smears of *Hyalomma* collected from camels in Sinai.

Concerning *Hepatozoon spp.*, this *Apicomplexa* exhibited a wide variety of life cycles, which was commensurate with the range of vertebrate and invertebrate hosts utilized by this parasite. However, a basic life cycle of sporogonic development and oocyst formation occurred in hematophagous invertebrate, whereas, merogonic and gametogonic development occurred in vertebrates that ingested infected invertebrates (Smith, 1996). So, a diagrammatic life cycle of a typical *Hepatozoon spp.* was repre-

Fig 1. Leptomonas form of *Trypanosoma evansi* in salivary gland smear of *Ornithodoros savignyi* stained with Giemsa. X 1250.

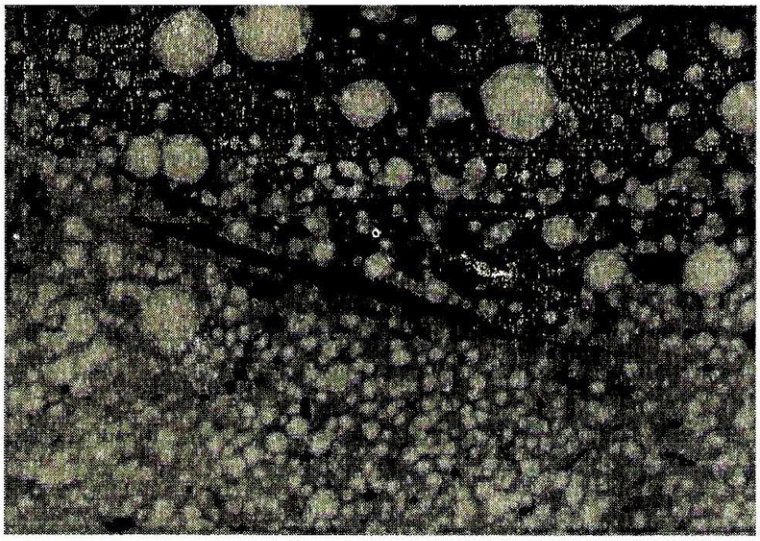


Fig 2. Sheathed Microfilaria in blood smear of *Ornithodoros savignyi* stained with Giemsa stain. X 2000.

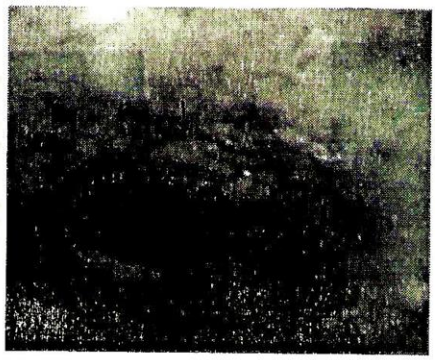
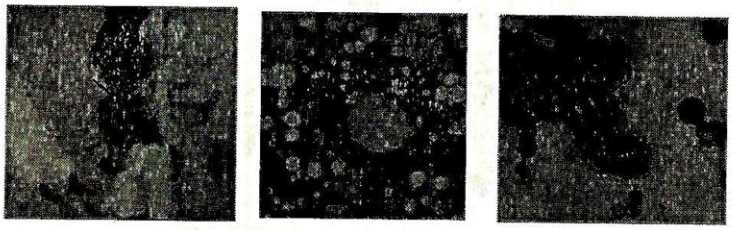
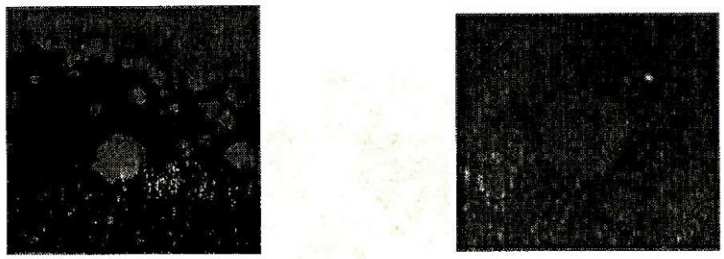


Fig 3. Microfilaria in gut smear of *Hyalomma dromedarii* stained with Giemsa showing the presence of cephalic space. X 1250.



a b c

Fig 4. *Hepatozoon dromedarii* stages within parasitophorous vacuole in haemolymph smear of *Hyalomma dromedarii* stained with Giemsa. a- Macrogamete. b- Microgamete. c- A binucleated structure interpreted to be syngamy. X 1250.



a b

Fig 5. a-An early formed zygote of *Hepatozoon dromedarii* with 2 nuclei on the periphery. b- More advanced stage of zygote showing darkly stained nucleoli in haemolymph smear of *Hyalomma dromedarii* stained with Giemsa. X 1250 .

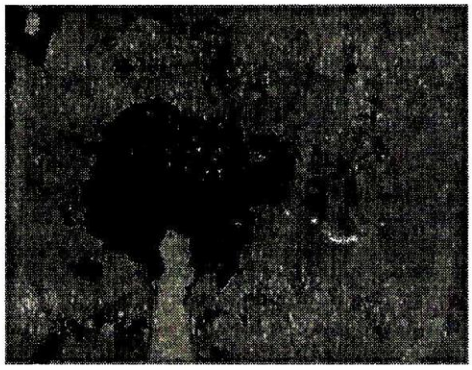


Fig 6. Oocyst of *Hepatozoon dromedarii* showing numerous sporocysts, which appeared as blue dots in haemolymph smear of Hyalomma stained with Giemsa. X 1250.

sented by this author. He stated that microgamonts and macrogamonts were passed through the gut wall of the invertebrate into the haemocoel and entered fat body cells where they were associated in a parasitophorous vacuole; the resulting zygote was expanded into an immature oocyst, which underwent nuclear segmentation during sporoblast formation. Then, mature oocyst containing numerous sporocysts was formed and, depending on the species, the sporocysts might contain 4 – 64 sporozoites.

In the present study, different developmental stages of *Hepatozoon spp.* were detected in the gut and haemolymph of *H. dromedarii.* Macrogamete and microgamete were seen in parasitophorous vacuole in haemolymph; they measured 4.38 µm and 2.5 µm, respectively. A binucleated structure, interpreted to be syngamy, was found as well as in haemolymph, it measured 2.5 (m. Also, there was an early formed zygote with 2 nuclei on the periphery in parasitophorous vacuole and measured 4.38 x 3.75 µm, and a more advanced stage of zygote with several darkly stained nucleoli measuring 10 µm was seen. The oocyst was detected in gut and haemolymph smears. It appeared spherical to oval in shape and contained numerous sporocysts appearing as blue dots; it measured 8.75 – 21.25 x 8.75 – 25 µm.

Smith (1996) suggested that the dimensions of oocysts could be influenced by different factors such as infection load of arthropod vector, species of the vector, and the temperature at which the vector lived while the parasites developed. The observations in the present study supported Smith's conclusions.

Mathew *et al.* (1999), represented the sporogonic development of *Hepatozoon americanum* in gut cells, and mature oocysts into the haemocoel in *Amblyomma maculatum* collected from dogs. They did not detect any stages in salivary glands, a fact which was consistent with that reported in the present study. Also, they stated that oocysts in various stages of development could be seen within the same tick. This might explain the wide range in measurement of oocysts.

Smith and Desser (1997) reported that syngamy and sporogonic development of many *Hepatozoon spp.* had been seen within the haemocoel of the definitive host, a fact, which coincided with that reported in the present study.

Concerning Microfilariae, they had a prominent sheath, and were detected in sali-

vary glands, gut and blood smears of *H. dromedarii* and in blood smears of *O. savignyi*. They measured 61.3 x 1.56 µm and 56.25 x 1.25 µm, respectively.

Inokuma *et al.* (1998), detected a Microfilaria of 160 x 6 µm without sheath in haemolymph of female *Rhipicephalus sanguineus* collected from dogs; they could not determine the detailed structure of Microfilaria in the smear, so they did not identify it.

Thomas (1979) found that the intermediate host of *Dipetalonema witei* was *Ornithodoros moubata*.

In the present study, there were no prominent differences in the external features, as well as, measurements of Microfilariae detected in both *H. dromedarii* and *O. savignyi*; a fact, which led to the similarity of species of such Microfilariae. The difference in measurements of Microfilariae detected by Inokuma *et al.* (1998), and that seen in the present study might be ascribed to the difference in Microfilaria and tick species and the host from which ticks were collected.

From this study, it is concluded that ticks of the species *H. dromedarii* and *O. savignyi* can play the role of intermediate hosts of *Trypanosoma evansi* and *Dipetalonema evansi* in camels.

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تمييز أطوار بعض طفيليات الجمال التى تنتقل بواسطة القراد

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تم تجميع ٤٥ فردا بالغا من قراد هيالوما دروميداري و ٢٧ من قراد أورنيثودورس سافجنى من الجمال المعدة للذبح بمجزر البساتين بالقاهرة. تم أخذ مسحات من الأمعاء ,الغدد اللعابية, السائل الليمفاوى و الدم ,ثم تم صبغها بصبغة الجيمسا. بالفحص الميكروسكوبى ,تبين وجود طور التريبانوسوما ليبتمونـاس فى ٣ مسحات من الغدد اللعابية و ٤ مسحات من دم قراد أورنيثودورس وفى مسحات الغدد اللعابية والأمعاء لستة أفراد من قراد هيالوما. كذلك وجد طور ميكروفيلاريا فى ٣ مسحات دم من قراد أورنيثودورس و ٩ مسحات من الغدد اللعابية، ٩ مسحات من الأمعاء، و ٦ مسحات من دم قراد هيالوما. كما وجدت أطوار عدة لطفيل هيباتوزون فى ٣ مسحات من الأمعاء و ١٢ مسحة من السائل الليمفاوى لقراد هيالوما.

و يتبين من هذه الدراسة أن القراد من نوع هيالوما دروميداري و أورنيثودورس سافجنى يمكن أن يلعب دور العائل الوسيط لطفيل التريبانوسوما و ديبتالونيما إيفانزى فى الجمال.