Shalatin regional lab.
Animal Health Research Institute

# SOME STUDIES ON BLOOD PARASITES IN CAMELS (CAMELUS DROMEDARIUS) AT SHALATIN CITY, RED SEA GOVERNORATE

(With 4 Tables and 3 Figures)

By
***O.M. MAHRAN***

(Received at 25/5/2004)

## بعض الدراسات على طفيليات الدم فى الجمال (وحيدة السنم) بمدينة شلاتين بمحافظة البحر الأحمر

عثمان محمد مهران

تـم إجـراء البحـث على عدد ٤٥٠ جمل من الجنسين ومن مختلف الأعمار من يناير إلى ديسمبر ٢٠٠٣ بمدينة شلاتين بمحافظة البحر الأحمر لمعرفة معد ل الإصابة بطفيليات الدم فـي. الجمـال . أوضحت ا لنتائج أن ٢١,٣١ فى المائة من الجمال مصابة بطفيليات الدم. مثلـت التريبانوسـوما ١١,٥٥ في المائة والثيليريا ٦,٤ في المائة واخيرالفلاريا ٣,٣٣ في المائة.وكانت الاصابة في الاعمارالكبيرة اعلى من الصغيرة وفي الاناث اعلي من الذكور وفي الصيف اعلي من الشتاء وكان لوجود الطفيليات تأثير واضح على صورة الدم حيث كان هناك أنيميا التي تتميز بالضمور الخلوي وخلل فى العدد التباينى لكريات الدم البيضاء.

## SUMMARY

A survey was done on 450 camels from Shalatin city at different ages and sex from January to December 2003 to detect the incidence of blood parasites in camels. Out of 450 examined camels, 21.31% were naturally infected with blood parasites. Of these animals, 11.55% were infected with Trypanosoma evansi, (6.2%) infected with Thieleria camelensis (3.33%) infected with Dipetolonema evansi microfilarie. The highest rate of infection with blood parasites in camels was during the summer season and the rate of infection was higher among older camels than younger individuals. In addition, the rate of infectivity among females was more higher than males. Hemogram revealed macrocytic normochromic anemia and disturbances in the leucocytic count.

***Key words:*** *Blood parasites, camels.*

# INTRODUCTION

Camels are considered to be one of the valuable sources for meat, milk, wool industry, transportation and drought power. Camel population in Egypt is 133,000 (FAO-OIF-WHO, 1995), more than 42 thousands of them inhabit Shalatin area. Blood parasites in camels may cause many problems. They might not only a direct cause of death but also they affect the general condition of camels (Higgins, 1986).

The pathogen city of certain blood parasites may induce immune suppression in the host and increase the susceptipility of camels to other diseases (Roelants and Pinder 1984) Moreover, Luckins (1992) added that, blood parasites in camels specially Trypanosoma cause death to animal within seven days if untreated in acute form. In the chronic form a huge production loss occurs due to the lowering of milk and meat production, abortion and induction of premature birth in addition to inability to feed (Yail, 1994).

Thieleriosis is one of tick borne diseases group of mammalian host such as cattle, sheep, goat and wild ruminnant (Barnett, 1960 and El-Begawey, 1983). Infection with Theileria spp. may cause lymphoproliferative disorders which may lead to anemia, leukopenia and affects the resistance of animals (El-Sergny *et al,* 1991). Studies on theileriosis in camels are very scarce and little information had been provided.

Dipetolonema evansi (microfilarie) is the only species of filarial worm that has been associated with clinical illness in camels with heart insufficiency, arteriosclerosis and parasitic orchitis (Nagaty 1947 and Kornienko–Koneva and Orekhov, 1958).

Shalatin City is a representative area for the southern part of Egyptian eastern desert. This part is considered a virgin area in veterinary studies. No field studies have been carried out on blood parasites in camels in this area. Therefore, the objective of the present work was done to record the incidence of some blood parasites in camels in this area and the effect of age, sex and seasons on the rate of infection with blood parasites. In addition, to studying some hematological changes in blood of infected camels.

# MATERIAL and METHODS

**Animals and clinical signs:** The present study was done during the period from Jan. to Dec.2003. Four hundred and fifty camels at different ages and sex belonging to Shalatin City were used in this study.

Complete clinical examination of ailing camels was done according to Higgins and kock. (1984) and Kohler-Rollefson *et al.* (2001). The examined animals with respect to age were classified into 3 groups, (1-5 years, 80 camels), (6-12 years, 325 camels) and (<12 years, 45 camels).

**Sampling:** Blood samples were drained from each camel by jugular vein-puncture on heparinized vacuum tubes.

**Parasitological examination:** Blood films (wet, thick and thin) were prepared from fresh blood. Buffy coat was obtained through the microheamatocrit centrifugation technique. Knott's technique was done for detection of mild microfilarie (Boild *et al* 1985 and Coles, 1986). The non-and stained blood films (by Giemsa stain) were examined by light microscope for detection of blood parasites (lowrenece and Thoma 1987). The detected parasites were identified according to the description given by levine (1985) and Soulsby (1986) and drown with lucida camera. The average dimension of various anatomical regions was deterimined by eyepiece micrometer.

**Haematological examination:** A total of 30 blood samples from 30 camels, which proved to be infected with blood parasites, were classified equally into three groups (10 samples each). Group (1) was infected with Trypanosoma evansi, group (2) was infected with Thieleria camelensis. and group (3) was infected with D. evansi microfilerie. Another 10 blood samples from 10 healthy camels were used as control group (Group 4). Blood samples were used for hematological studies for estimation of haemoglobin (Hb), packed cell volume (PCV), total erythrocytic count (RBC), total leucocytic count (WBC) and differential leucocytic count (DLC) (Schalm *et al* 1975).

**Statistical analysis:** Obtained data were subjected to a software program (SPSS) according to Borenstein *et al.* (1997).

## RESULTS

**Clinical signs:** The observed clinical signs on camels infected with blood parasites were pale mucous membrane, rough hair coat; weakness, depression, gradual emaciation, inappitance, watery eye, hind limb weakness and some animals remained in sternal recumbencey.

**Parasitological findings:** Out of 450 camels examined, 96 (21.31%) were naturally infected with blood parasites. Of these infected animals 52 (11.55) were harboring Trypanosoma evansi, 29 (6.44%) Theileria camelensis and 15 (3.33%) D. Evansi microfilarie (Table, 1)

**Morphological characters of Trypanosoma evansi (Plate, 1):** The Trypanosoma detected was characterized by long slender Trypanosome with prominent undulating membrane, long free flagellum and small sub terminal kinotoplast The measurement of Trypanosoma evansi were (17-26) μm length (mean 21.5 μm), (1-1.5) μm width and free flagellum (5-7) μm (mean 6 μm.

**Morphological characters of Thieleria camelensis (Plate, 2):** Examinations of blood films revealed oval and ring forms of Thieliera in erythrocytes in addition to microschizonts and macroscizonts in lymphocytes. The oval form measured (1.24x.0.4) μm and the ring form was (1.25) μm while the microschizonts and macroschizonst measurement were (2.3 - 3.4) μm and (3.6-4.22) um respectively.

**Morphologicl characters of D. evansi microfilarie (Plate, 3):** Dipetalonema.evansi microfilarie detected was characterized by unsheathed microfilarie tend to be straight but its ends are slightly curved, with transverse striation cuticle and well developed somatic nuclei. Their measurements were ranged from (232.8-291.6) μm in length (mean 261.2 μm), and (5.4-7.5) μm in width (mean 6.4 μm).

**The effect of age and sex on the rate of infection with blood parasites table (2):** The results indicated that the infectivity rate was affected by age of animals. Group (6 – 12) years showed the highest infection rate. On the other hand, the infectivity rate was higher in females than males.

**The effect of seasons on the rate of infection with blood parasites table (3):** It was noticed that the highest rate of infection was in summer and the lowest rate was in winter. Both spring and autumn seasons occupied nearly similar values.

**Table 1:** Prevalence of blood parasites in examined camels

| No.of examined camels | No.of infected cases | % | Trypanosoma evansi | | Thieleria camelensis | | D. Evansi Microfilarie | |
|---|---|---|---|---|---|---|---|---|
| | | | No | % | No | % | No | % |
| 450 | 96 | 21.3 | 52 | 11 .55 | 29 | 6.44 | 15 | 3.33 |

**Table 2:** The effect of age and sex on rate of infection with blood parasites in examined camels

| Age groups | Examined Animals | | | Infected Animals | | | % Of infected animals | | |
|---|---|---|---|---|---|---|---|---|---|
| | T* | M | F | T | M | F | T | M | F |
| 1-5 years | 80 | 62 | 18 | 11 | 8 | 3 | 13.75 | 12.90 | 16.66 |
| 6 - 12 years | 325 | 255 | 70 | 77 | 57 | 20 | 23.69 | 22.35 | 28.57 |
| <than 12 years | 45 | 18 | 27 | 8 | 3 | 5 | 17.77 | 16.66 | 18.51 |
| Total | 450 | 335 | 115 | 96 | 68 | 28 | 21.33 | 20.29 | 24.34 |

T=total, M=male, F=female

**Table 3:** Effect of seasons on rate of infection with blood parasites

| Seasons | Examined animals | No. of infected cases | Trypanosoma evansi | Theileria camelensis | D. evansi Microfilarie |
|---|---|---|---|---|---|
| Winter | 45 | 6 | 4 | 2 | ------ |
| Spring | 88 | 16 | 7 | 7 | 3 |
| Summer | 235 | 59 | 33 | 15 | 10 |
| Autumn | 82 | 15 | 8 | 5 | 2 |
| Total | 450 | 96 | 52 | 29 | 15 |

**The effect of blood parasites on haemogram of camels:** With respect to haemogram (table, 4), there was a significant reduction in the mean values of RBCs count, PCV %, and Hb concentration in all ailing groups and significant elevation in leucocytic counts characterized by increase in lymphocytes, esionphils and monocytes. This led to macrocytic normochromic anemia

**Table 4:** Blood parameters of camels infected with blood parasites

| Parameters | Control | T.evansi | Theileria camelensis | D. evansi Microfilarie |
|---|---|---|---|---|
| Total RBC x $10^6$/ul | 9.5± 0.20 | 6.11± 0.79 | 6.2 ± 0.77 | 6.5± 0.45 |
| Total WBC x $10^3$/L | 10.8± 1.22. | 11.2± 0.58 | 13.2± 1.20 | 11.8± 0.66 |
| PCV % | 28.30± 2.43 | 21.10± 2.69 | 22.4± 2.69 | 21.40± 1.77 |
| Hb % | 12.6± 1.25 | 8.3± 1.66 | 8.1± 1.67 | 8.4±.66 |
| MCV | 29.79±1.5 | 34.53± 2.3 | 36.12± 2.1 | 32.92± 3.1 |
| MCH | 13.26±1.8 | 13.58± 1.1 | 13.06± 1.2 | 12.92± 0.9 |
| Lymphocytes | 48.4.5 ±1.1 | 49.1± 0.66 | 52.3± 4.22 | 49.3± 0.53 |
| Neutrophils | 42.8± 0.44 | 39.5± 5.22 | 37.3± 4.25 | 40.1± 2.11 |
| Eosinophil | 5.2± 0.33 | 7.5± 1.76 | 6.5± 1.33 | 7.1± 1.65 |
| Moncytes | 3.6± 0.1 | 3.9± 0.25 | 3.9± 0.32 | 3.5± 0.22 |

# DISCUSSION

The observed clinical signs seen in infected camels in this study were in agreement with those described by Hunter (1986), Higgins (1986), El Amin *et al* (1998), Awad (1996), and Kohler-Rollefson *et al* (2001).

The present study clarified that the incidence of natural infection with blood parasites in camels was (21.31 %). Trypanosoma evansi recorded the highest incidence among these blood parasites (11.55 %) followed by Thieleria camelensis. (6.4%) while D evansi microfilarie represented the lowest percentage and recorded (3.33 %). Our finding was in agreement with Selim *et al.* (1970), Yousef (1978), Fayed *el al;* (1984), EL-Sergany, *et al.* (1991), El- Sawalhy and Ebied (1994), Zarif-Fard and Hashemi-Fesharki (2000), Thewordros andGetochew (2001) and Arafa (2002)and Hamoda (2002). Meanwhile, our results were lower than those reported by Pegram and scott (1976) and El.Amin *et al* (1993), Woldemeskel *et al* (2001)

In the present study T.evansi was found to be the only trypanosoma species in infected camels similar results were obtained by Pergram and Scott (1976) Elamin *et al* 1998 and Thewodros and Getachew (2001).

The pathogenicity of Thieleria depends and associated with injurious mechanisms of either macroschizonts, microshizonts and piroplasm, or on the piroplasm alone (Levine 1985)

Examination of blood films in the current work revealed two forms of Thieleria in erthyocytes oval and ring forms in addition to macroschizonts and microschizonts in lymphocytes. These results similar to those seen by Nassar (1992), El-Refaii *et al* (1998) and Mazad and Khalaf (2002).

The morphological form and size of microfilarie described in our study agree with those given for microfilarie of D. evansi Microfilarie by Levine (1968). Unsheathed microfilarie were detected in the blood of examined camels. These results were similar to that described by Mason (1916), Abdel-tatif (1957), Ramadan (1982), Mahmoud (1998) and Arafa (2002) but sheathed microfilarie were reported in camels by Yakinnoff, (1916), Nagaty (1947), Levine (1968) and Arafa (2002). This worm was classically associated with arteriosclerosis, heart insufficiency and parasitic orchitis of camels (Nagaty, 1947; Kornieenro-Koneva and orekhov (1958) and Losos (1986). Such pathological sequels were

conspicuously absent in the camels in the present study this might be due to the differing in the sites of infection (Denhan and Nelson, 1976).

The results indicated that the infectivity rate was affected by age of animals. Middle age group (6 – 12 years) showed the highest rate of infection while youngs (1-5 years) showed the lowest rate of infection. This is due to young animal first acquires immunity passively and suffer only transient infection with mild clinical signs. These infections stimulate active immunity (Urquhart *et al* 1996). The prevalence of infection with blood parasites was decreased in aged group more than 12 years. These results agree with that recorded by Rahberi and Bazargani (1995) and Arafa (2002) who mentioned that this might be attributed to age resistance and significant inverse relationship between age of animals and prevalence of parasitic infection. On the other hand, the incidence of infection was higher in females than males. The reason for this is uncertain. (Zarif - Fard and Hashemi-Freshark, (2000). On the other hand, the differences in management, stress of pregnancy and lactation in addition to some hormonal factors might be contributed to this differences in the prevalence of blood parasites between males and females (Skidmore and Adams, 2001)

Data concerning the seasonal variation showed that the highest rate of infestation was during summer. This might be due to correlation between the infestation and increase in the density of fly population as reported by Mahmoud and Gray; (1980), ElAmin *et al,* (1998) and and Zeleke and Bekele (2001). Urquhart *et al*, (1996) add that the very high ambient tempereature during summer in desert area and lack of green fodder feed lead to lowering the animal resistance and hence high rate of parasitic infection occur.

With respected to hemogram, there was a significant decrease in the level of RBC, Hb and PCV reflecting anemia. Similar results were recorded by Raisanghani *et al*, (1981) and Higgins (1986). The cause of anemia during blood parasitic infection may be multifactorial. The direct effect of the parasites to the infected erythrocytes may be incriminated or decrease in life span of RBC and also suppression of haemopiotic system (Levine, 1985). Also, Kreier *et al* (1964) added that anemia in infection with blood parasites is due to extensive erthrophgocytosis initiated by parasitic damage to erythroctytes and the antierthrocytes autoantibody changes in the bone marrow are an indication to bone marrow depression.

Leucocytosis which accompanied by increase in the lymphocytes, eosinophil and moncytes in the present study was in agreement with that

reported by El..Magawry (1983), Manna (1990), Ngiru *et al.* (2000). The increase in WBC is due to stimulation of lymphoid tissue and piuripotent stem cells in the bone marrow by the parasites and their toxins (Omuse, 1978 and Soulsby 1986). Urquhart *et al* (1996) add that leucocytosis occur as result to lymphoid depletion and disoraganization with massive lymphocytes. Lymphocytosis especially in Theileria camelensis infected camels agree with that recorded by Luckins (1992) and Urquhart, *et al.* (1996) who stated that lymphocytosis was marked during the formation of antibodies in response to antigen and during theileria infection.

## REFERENCES

*Abdel – latif. K (1957):* Incidence of blood intercopuscularparasites of camels and their therapy, M.D. Vet Thesis .Cairo University

*Arafa. M.I (2002):* Studies on two types of Microfilarie in camel's blood in Upper Egypt. Assiut. Vet. Med. Vol. 48 No 95 91- 99

*Awad, H. E. S. (1996):* Studies on parasitic infection in camel. Ph. Thesis (Infectious diseases) Fact. Vet. Med. Cairo University.

*Barnett, S .F (1960):* Connective tissue reaction in acute fatal east cost fever T. parva of cattle. J. of Infectious Dis.107 2253-282.

*Coles, E. H. (1986):* Veteraniary clinical pathology, 4th Ed.W.B. Sounders campany Philadelphia, London, Toronto.

*Boild. R. Jones, T. w. and luckins A.G (1985):* Protozal diseaes of camels. Brit.Vet. J. 141. 87 – 105.

*Borenstein, M; Rothstein, H. and Cohen, J. (1997):* Sample Power Statistics 1.0. SPSS Inc., Chicago.

Coles, E. H. (1986): Veterinary Clinical Pathology. 4th Ed. Saunders Comp. Philadelphia, London, Toronto. Schmidt.

*Denham D.A. and Nelson G .S (1976)*: Pathology and Pathophyiology of nematode infection of lymphatic system and blood vessels .In pathology of parasites infection, ed E .J. L. Soulsby, pp 115-32 New York, Academic Press

*El Amin E. A, Mohamed G.E, Fadlm M., Seham E., Saleem M.s, and Elbashir M.O.A (1993):* Anoutbreak of cameline Filaiasis in the Sudan. Br. Vet. J. 149 – 153.

*El Amin, E.A.Elbashir, M.O.A and Saeed, E.M.A (1998):* prevalance and infection pattern of trepansoma evansi camels in mid – Eastern Sudan. Tropical Animal Health and Production. 30: 107-114.

*El Begawey, M.B M (1983):* histopathological study on bovine theileriosis, M .V. Sc. Cairo University

*El Magawary, S.E.M (1983):* Parameter of some blood constituents in normal and diseased camels PH these, Fact. Vet. Med.Zagazing University.

*El.Sawalhy, A.A; and Ebeid, M.A. (1994):* Evaluation of different methods of diagnosis for camel trypanosomasis Beni- Suef Vet. Meds. Rres.,IV(1/1):70-79

*El-Refaii .M .A .H., Wahab, A .A and Gehan J .S. (1998):* studies on thielieria infection among slaughtered camels in Egypt J.med.Sci 19(1) 1-17.

*El-Sergany, M .A., Saufy, H., Latif, M.M Hassanain, M. A. and Sash S. Laila, M.A., Nassar, A. M.(1991)*: lymphadentis in Egyptian camels with special references to bacteriological and parasitological affections in Egypt J .comp. Path. Clin. Path. 4 (1) 25 -45.

*FAO-OIF-WHO (1995):* Animal health year book., vol 36 127 – 176.

*Fayed, A.A.; Arab, R. M.; Abozeid A.A; youssef, R. R. and Awad, M.M (1984):* Studies on some diagnostic aids and chemo thrapeutic drugs of camels trypanosomiasis. Vet. Med. J., 32 (3): 219 – 227.

*Hamoda, F. K. (2002):* Studies on camels, trypanosomosis with special reference to concomitant infections. Egypt. Vet. Ass. 62 No 5 167 – 182

*Higgins, A. J. (1986):* the camel in health and disease, Baillere Tindall, London, Philadelphia, Toronto.

*Higgins, AS. J., and Kock . R.A., (1984):* The camel in health and disease .1 Aguide to the clinical examination, chemical restraint and medication of the camel., Brit Vet .,J 140-485 –504

*Hunter, A.G (1986):* urine colour in a camel suffering from surra (T.evansi Infection Tropical animal health and production., 18 : 146 : 148

*Kohler–Rollefson, L.; Mundy, P.and Mathias, E. (2001):* Afield manual of camel diseases (Traditional and modern health care for the dromedary. Short Run press, Exeter., UK .

*Kornienko-Koneva, Z.P. and Orekhov, M.D. (1958):* La Prophylaxie deqlue sparasitaires maladies des chameaux dans la .R.S. S de Turkmenie Bull .Int .Epizooty 49, 297-304

*Kreier, J.P., Ristic, M. & Schroeder, W. (1964)*: The pathogenesis of anemia producesd by infection with anapla mosis Amer.J.Vet. Res. 25-343-352.

*Levine, N. D. (1968):* Filarial nematodes .In nematodes parasites of domestic animals and man. Burgsess Puplighing Co. Minneapoils, Minu, USA Pp 436-518.

*Levine, V. D. (1985):* Veterinary protozoology 1st Iowa State University Press Ames.

*Losos, G. (1986):* Filarisis Jnfectious tropical dieases of domestic animals. Long man Scientific and Techn., England. Pp851-870.

*Lowrence, R. and Thomas, G (1987):* parasites: Aguide to laboratory procedures and identification (1st ed). American society clinical pathologist, Chicago.

*Luckins.A.G (1992):* protozal diseases of camel's procceding of the first international conference 2nd - 6th 23 – 27

*Mahmoud, A. El – Sayed (1998):* laboratory diagnosis of filariasis in Assiut Governorate.Ph.Med. Thesis, Assiut University.

*Mahmoud, M. M. M.and Gray. A.R. (1980):* Trypanosomiasis due to trypanosoma evansi review of recent research. Trop. anim. health prod., 12;35 –47.

*Manna, A.M.M (1990):* Clinical hemato logical and some bio chemical changes in healthy and diseased camels Ph.D. Thesis Fac. Of vet. Med. Assiut University.

*Mason, F .E (1916):* Further note on filariae in the blood of camels in Egypt J .comp .path .26, 329-39.

*Mazad S., A., Khalaf., S., A., (2002):* studies on thieleria and babesia infecting live and slaughter animals in Ak-Arish and El – Hasanah north Sinai governorate Egypt J., Egypt Soc parasito., 23 (2) 601 –610.

*Nagaty, H.f. (1947):* Dipetalonema evansi (lewis 1982) and its microfilarie from Camelus dromedrius Parasitology 38.86 – 93.

*Nassar, M.A. (1992):* Theilieria infection in camels (camelus dromedaries in Egypt. vet. parasit. (43) 147-149.

*Ngiru Z.K, Olaho – Mukaniw. Khaemba B. M., Ochieng R. S. and Ndung J. M (2000):* Hematologicel and serological changes during acute trypanosoma evansi infection in dromedary camels (camelus dromedarius journal of camels practice and research. Vol. 7 No 1 P. 113 – 116.

*Omuse, J.K. (1978):* A comperative hematological picture of field cases of east coast fever, anaplasmosis, babesiosis in bovine around Kabote. Edinburoyh Mk center for tropical veteriunay medicine 181-187.

*Pegram, R.G and Scott, J.M (1976):* The prevalence and diagnosis of T. evansi infections in camels in Southern Ethopia. Tropical animal health and production 8: 20 – 27

*Rahbri, S., and Bazargani T., T., (1995)*: blood parasites in camel of Iran J., Vets. Parasitol .9; 45 –46S

*Raisanghani, P.M.Bhatia, J.S., Dwankanath P.K. Arya, P.I and lodha, K.R.(1981):* Pathology of experimental surra in camel ind. J . Amin .Sci 50 960-969.

*Ramadan, E.H (1982):* Studies of Acanthochielonema.evansi with special reference to the distribution of microfilarie in the different organs of the camels and their elimination from circulatory blood Ph. D Vet. Thesis, Cairo University.

*Roelants, G.F. and Pinder, M. (1984):* Immunobiology of African Trypanosomiasis. Contemp. trop. Immunobiol.,12.255-271.

*Schalm, O. W; Jain N. C & Carall E. T (1975):* Veterunay Haematology, 3rd Edn.lea & febiger, Philadelphia.

*Selim, M.k; El – Refaii, A.H; El – Amrous, Shosny, z. (1970):* Studies on the variaus parasites horbouing imporated animals to U.A.R. with special reference to their pathology.Vet.Med. J.: 17-173-194.

*Skidmore, L. and Adams, G. P. (2001):* Recent Advances in Camelid Reproduction. International Veterinary Information Service . Ithaca, New York, USA.

*Soulsby L.E. (1982):* Helminthes, Arthopods and protozoa of domesticated animals. 7thEd.Baltimore, wiltiams and wailkin group.

*Thewodros T. and Getachew A. (2001):* Trypanosomosis and Helminthoses major health Problems of camels (camelus dromedaries) In the southern Rangelands of Borena, Ethiopia. Journal of camels practice and Reseanch val 8 No1, P39 – 42

*Urquhart, G. M. Armour, J., Duncun, J., L., Dunn, A.M., andJennings, F., W (1996)*: veterinary parasitology end Ed Blackwell Scien

*Woldemeskel M., Lssa A.; Mersie A. and potgieter L.N.D (2001):* Investigation of parasitic diseases of one –humped camel (camelus dromedaries) in Easteran Ethiopia. Jouronal of camel practice and research vol.8 No.1 P.77-81

*Yagil.R.(1994):* The camels in today world. A Hand boakan camel Management (Research repot 1, Deutscre welthimger hife, Germany.

*Yakinoff, V.L et al (1916):* studies on a sheathed microfilarie in the blood of camels (camelus bacterianus) from Russian Turkestan Bull. Soc. Path. Exot, 9: 219 – 223.

*Yousef F .M..(1978):* Some studies on diagnosis and treatment of blood parasites in camel M. Vs. thesis fac .Vet. Med. Zazaga University.

*Zarif-Fard, M. and Hashemi – Fesharki,R. (2000):* Study on Tissue and blood protozoa of camels in Southern Iran Journal of camels Practice and research Vol. 7 No 2. P. 193 –

*Zeleke, M. and Bekele (2001):* Effect of season on the productivity of camels (camelus dromedarius) and the prevalence of there major parasites in Eastern Ethiopia. Tropical animals health and production 23 321- 329.

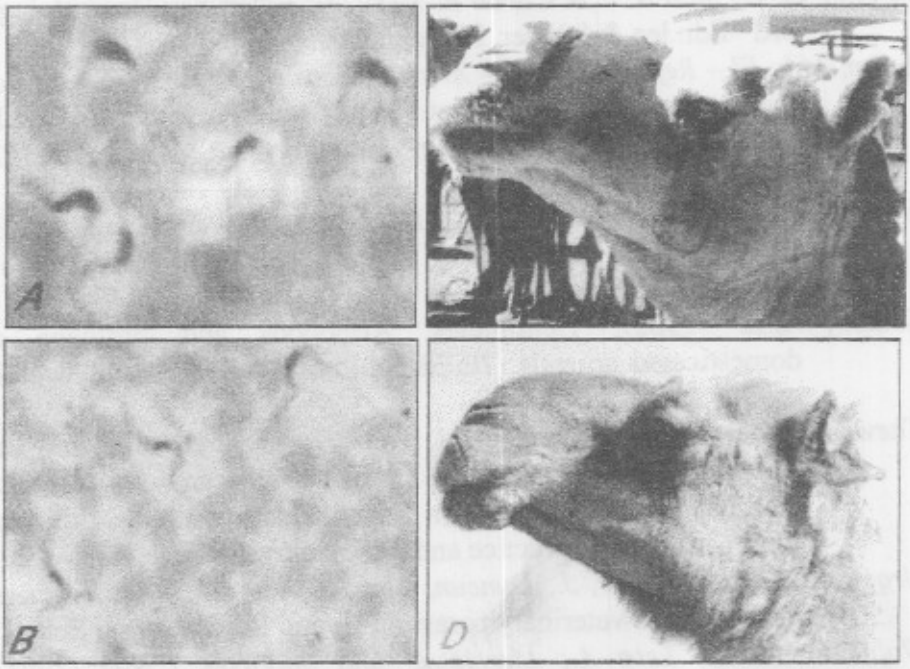


**Fig. 1:** Trypanosomiasis in camel.
A & B, T. evansi x1000
C & D Watery eye in camel infested with T. evansi

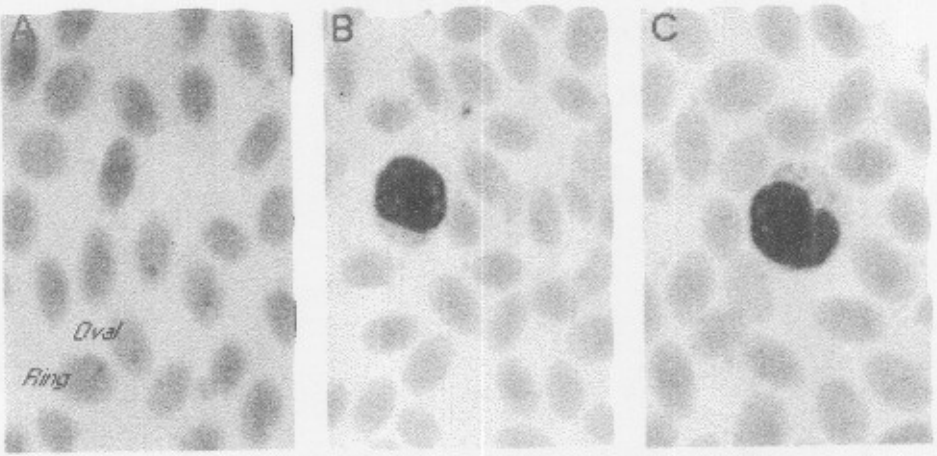


**Fig. 2:** Theileria in camels
A) Erythrocytic forms.
B) Microschizont. x 1000
C) Macroschizont x 1000

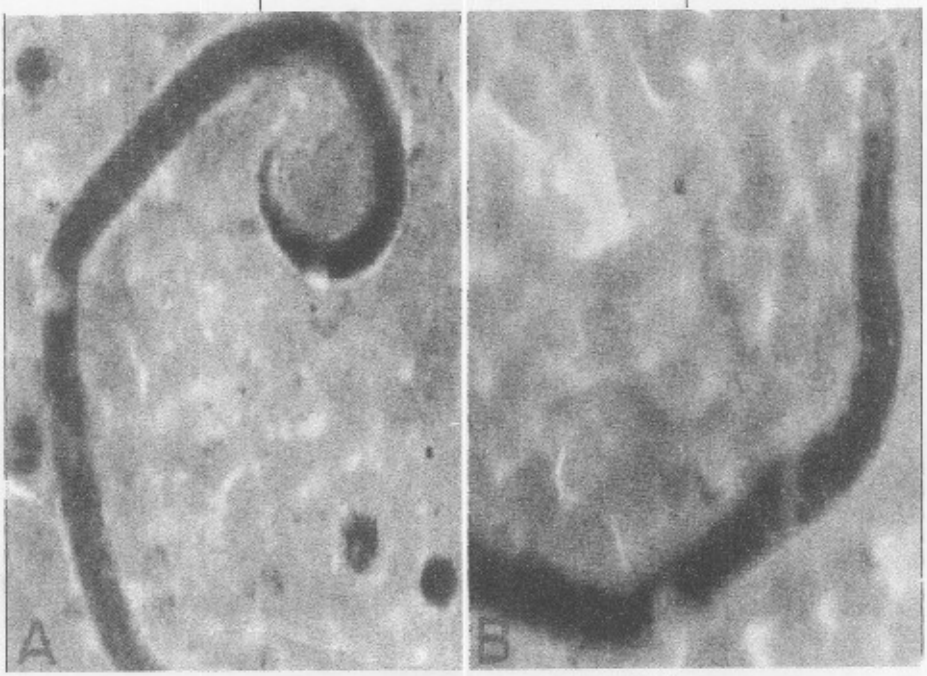


**Fig. 3:** D. evansi microfilarie in camel.
A) Posterior end. x 1000
B) Anterior end. x 1000