Alexandria Journal of Veterinary Sciences
www.alexjvs.com

AJVS. Vol. 54: 25-28. July 2017
DOI: 10.5455/ajvs.260682

Fatal Cowdriosis (Heartwater) and Trichurosis in a Camel Bull (*Camelus dromedarius*): a case report

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Key words:
Camel, Heartwater, Trichurosis, whipworms, Ehrlichia ruminantium, Nigeria

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ABSTRACT

A 5 year old male camel was reported dead in an institutional farm, and a routine postmortem was conducted on it. Adult worms were found in the lumen of the large intestines and segments of all intestines were sent to the parasitology laboratory for helminth identification. Rectal contents were also sent to the laboratory for oocyst screening. Lung and brain samples were also sent to the parasitology laboratory based on history. The result from the parasitology laboratory confirmed a helminth infection known as trichurosis and heartwater infection was also confirmed from presence of purple colonies of *Ehrlichia ruminantium* on the endothelium of capillaries close to the nuclei. Although it was hard to establish which of the infections caused the death of the animal but it is noteworthy that this case confirms natural susceptibility of the camel to both diseases and is capable of causing mortality in camels.

1. INTRODUCTION

The dromedary had disappeared in the wild for nearly 2,000 years. Wild dromedaries inhabited arid regions, particularly the Sahara Desert. The original range of the camel's wild ancestors was probably southern Asia and the Arabian Peninsula. Its range included hot, arid regions of northern Africa, Ethiopia, the Near East and western and central Asia. The dromedary typically thrives in areas with a long dry season and a short wet season. They are sensitive to cold and humidity, though some breeds can thrive in humid conditions (Wilson & Bourzat, 1987).

Heartwater is an infectious, noncontagious, tick-borne rickettsial disease of ruminants. The causative organism is an obligate intracellular parasite, previously known as *Cowdria ruminantium*. Molecular evidence led to reclassification of several organisms in the order Rickettsiales, and it is now classified as *Ehrlichia ruminantium.* Under natural conditions, *Ehrlichia ruminantium* is transmitted by *Amblyomma* ticks (Merck Manual, 2015).

Whipworms are common pathogens in animals, especially free-range animals, and under conditions of high intensity cause anaemia, diarrhoea, weight loss and neurological symptoms (Richard Olds, 2013, Blackie, 2014). In rare cases, they can result in the death of the host (Richard Olds, 2013).

2. Case history

A 5 year old camel bull was reported dead on an institutional farm. History revealed that the camel showed signs of weakness, diarrhoea, emaciation and rough hair coat (Fig 1). The camel was reported to have staggered gait shortly before death.

3. Materials and methods

3.1 Postmortem examination

The carcass appeared slightly emaciated, pale and dehydrated (Figure 1). There was presence of hemorrhagic ulcers in the abomasum. Adult worms were found in the lumen of the large intestines and segments of all intestines were sent to the parasitology laboratory for helminth identification. Rectal contents were sent to the laboratory for oocyst screening. Lung and brain samples were also sent to the parasitology laboratory based on history. No gross lesions in the lungs and brain were observed.

3.2 Laboratory investigation

Lung and brain tissues were fixed in 10% formalin, embedded in paraffin, sectioned at 6 ım, and stained with hematoxylin and eosin for histopathological examination. In addition, brain sections were fixed in methanol and stained with Giemsa.

Smears were made from the brain cortex (grey matter), cerebellum and cerebrum according to the method described by Leeflang (1972) and fixed in methanol and stained with Giemsa (Purchase, 1945). The stained smears were washed in tap water for 15 mm and areas containing networks of capillaries located and examined with an oil immersion objective.

Parts of the GI tract (small and large intestine) where transported to the laboratory under cold chain (ice pack). Each part was cut longitudinally and the mucosa examined and scraped carefully to remove any adhering worms. Contents of digestive tract were washed using tap water and sieved. The entire washings of organs were completely examined to find the parasites. The recovered adult worms were picked up with forceps, washed three times in distilled water, collected in physiological normal saline solution, and examined in fresh state. They were then preserved in 10% formalin and 70% alcoholglycerin for further detailed examination and identification. The rectal contents were also examined for parasite eggs and larvae by standard methods.

4. RESULTS

The result from the parasitology laboratory confirmed a high nematodal infection known as trichurosis from identification of the nematode eggs and adult worms based on vital parasitological keys (Fig 2 and 4). The eggs had a characteristic barrel-shape tapering at both ends to form the polar plugs (Fig 2). The adult worms were long with a thick, broad posterior end, tapering to a long, filamentous anterior end that is characteristically embedded in the mucosa (this is the whip-like end as shown in Fig. 4). Heartwater infection was also confirmed from presence of purple colonies of *E. ruminantium* on the endothelium of capillaries close to the nuclei (Figure 3).

Figure 1: Emaciated carcass of the dead camel

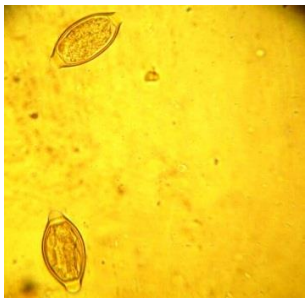

Figure 2: *Trichuris* eggs ×100.

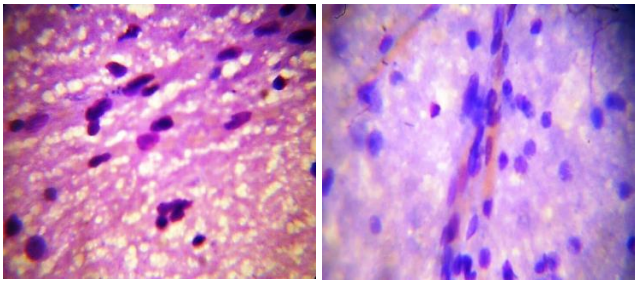

Figure 3: Brain squash smear showing purple colonies of *Ehrlichia ruminantium* on the endothelium of capillaries

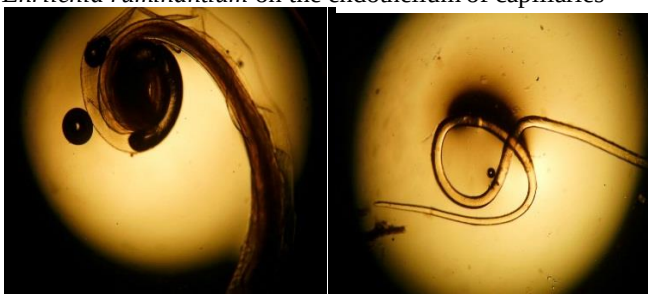

Figure 4: Adult Trichuris worms ×40

5. DISCUSSION

Heartwater in Nigeria is closely associated *Amblyomma variegatum* tick (Ilemobade *et al* 1977) which has been established as the incriminating vector. Although no tick was found on the carcass but it is possible due to the life cycle of the tick being a three-host-tick and also very abundant in the region (Allsopp *et al.* 2005).

E. ruminantium incidence in camels is quite rare and reports very scarce in literature although the Centre for Food Security and Public Health (2015) stated that there

have been reports of fatal cowdriosis in camel but reports are unproven.

As late as 1902, heartwater was thought to be a specific disease of sheep and goats, which were "the only animals known to naturally contract heartwater"(Lounsbury 1902). However, cattle along with sheep and goats are classical victims (Logan, 1987; Mutwakil *et al.* 2013). Heartwater has also been reported in wild ruminants e.g. Sitatunga in Nigeria (Okoh et al., 1987), eland *(Taurotragus onyx)* (Young and Besson, 1973) and in springbok *(Antidorcas marsupialis)* (Neitz, 1944). Clinical and post-mortem findings have been consistent with reports from the above named authors.

Clinical and laboratory diagnosis of *Ehrlichia ruminantium* is difficult by conventional methods. Serological tests are based on detection of antibodies by immunofluorescence or by enzyme-linked immunosorbent assay (ELISA). However, cross-reactivity between *Ehrlichia ruminantium* antigens and antibodies to several *Ehrlichia* spp. has been observed (Jongejan, 1991; Mahan et al., 1998; OIE, 2002). Molecular diagnosis is presently the most reliable approach for detection of *E. ruminantium* carrier animals and ticks (Waghela *et al.*, 1991; Mahan *et al.*, 1992; Mutwakil *et al.*, 2013). Clinical confirmation of this disease in Nigeria for now is usually done post-mortem.

Helminth infestation is precipitated by the severe stress brought on by the long migratory trip in which the camels are subjected to in the early rainy season **(**Awad, 1996; Agab and Abbas, 2001). Internal parasites constitute an important disease problem that affect the health and productivity of camel and is often more sound in areas and in certain seasons of the year (Majid *et al*., 1997). El-Bihari, 1985; Dakkak and Ouhelli, 1987 have described parasitic infections of camels in camel-raising countries. The helminth fauna of the gastrointestinal (GI) tract of camelids is particularly rich, up to almost 50 species (Dakkak and Ouhelli, 1987). The signs that were noticed in this camel before death were similar symptoms mentioned by (Fowler, 1996) such as weight loss, diarrhoea, anaemia, gastritis and enteritis. However, the clinical manifestations of helminthoses may be subclinical or asymptomatic, in which case the animal appears normal but performs below its full potential (Borji *et al*., 2010). Whipworms (*Trichuris* spp.) are significant parasites of camelids, and are resistant to treatment with the usual doses of anthelmintics which are effective for other GI nematodes. Fatal Trichurosis has been reported by Eo *et al*. 2014 in Seoul Zoo with adult worms found attached to the wall of the large intestine and diarrhea present which is in conformation with our findings in this case. Adult parasites are found in the caecum and large intestine. Whipworms cause marked enteritis, leading to diarrhea, dehydration and weight loss (Fowler, 1996). *Trichuris globulosa* is the most prevalent and trichurids of camels in a study conducted by Borji *et al.*, 2010 followed by *Trichuris barbetonensis*. Other *Trichuris* spp. have occasionally been reported to occur in camels: *Trichuris ovis*, *Trichuris cameli*, *Trichuris raoi*, *Trichuris skrjabini* and *Trichuris affinis* (Kaufmann, 1996), also *Trichuris lani* and *Trichuris infundibulus* by Anvari-Tafti *et al.*, 2013. This to the knowledge of the authors is the first confirmed case of cowdriosis infection combined with trichurosis reported in camels in Nigeria.

6. CONCLUSION

It was hard to ascertain which of the infections caused the death of the animal but it is noteworthy that this case confirms natural susceptibility of the camel to both diseases and is capable of causing mortality in camels. Prevalence studies of heartwater in Nigeria using molecular techniques is thereby recommended in domestic, captive and wild ruminants to better understand the behaviour of this economically important rickettsia parasite.

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