NASO-PHARYNGEAL MYIASIS IN SLAUGHTERED CAMELS IN WAJIR, ISILO AND GARISSA ABATTOIRS IN NORTHERN KENYA

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Abstract

Nasopharyngeal myiasis as defined by Zumpf (1965), Zumpf (1983), Hussein et al (1983) in the one humped camel (Camelus dromedarius) is caused by Cephalopina titillator, a camel bot fly. The condition has been studied in Somalia, Egypt and Kenya; however, the cultural practice of camel eating pastoralists of throwing away camel heads has caused the disease not to be recorded in Kenyan abattoirs.

The main objective of the study was to establish the prevalence and pathological effects of nasopharyngeal myiasis in slaughtered camels in Northern Kenya, and assess the impact of the condition in the camel meat trade in the Arid and Semi Arid Lands (ASAL).

A total of 252 camel heads in slaughter slabs at Isiolo, Wajir and Garissa district were purposively sampled. Data was collected by observation, structured questionnaires, key informant interviews, meat inspection, photography and enumeration of larvae. Camel nasal bot flies of various stages and sizes were detected in 100% of the sampled camel heads. There were no major visible pathological defects observed in the affected camels.

The study recommended that further investigation be done to determine the camel health and economic importance of the parasite in the ASAL areas of Kenya and management of the parasite in affected camels. It was also recommended that camel head inspection be done during routine meat inspection.

Keywords: myiasis Cephalopina titillator, camel bot fly, one humped camel, (Camelus dromedarius)

1. Introduction

The Arid and Semi Arid Lands (ASAL) make up over 80% of Kenya’s total land surface, support over 25% of human population and half of the livestock population. Severe drought events have had serious impact on ASAL pastoral communities, increasing their vulnerability to poverty and threatening their long term viability of their livelihoods and natural resource base.
According to Food and Agricultural Organization (FAO) statistics (2002), Kenya has an estimated population of 0.83 – 0.9 million camels. The major areas of concentration of camels are the ASAL areas of Northern Eastern of Kenya with Wajir district having the highest camel population (Farah 2001, GTZ – KASSIM, 2002). The camel is highly regarded as a food security, disease and drought resistant animal in the ASAL pastoral areas.

Although the camel is presumed to be resistant to animal diseases, there are certain diseases that commonly affect it. In the year 2005, common camel diseases recorded by the Veterinary Department included: trypanosomiasis, abscesses, helminthiasis, abortion, pneumonia, mange, mastitis and diarrhoea (Ministry of Livestock and Fisheries Dev. 2005).

Camel meat consumption is rapidly spreading from the remote ASAL areas to urban centres of Kenya and other communities are slowly beginning to eat camel meat. Since the eating habits of these communities vary, parts of the camel carcass like heads, offals except the liver which are not traditionally eaten by the pastoralists, are now being eaten by other communities in the neighbouring Tana River districts like the Malakote and the Akamba which have migrated to the ASAL areas.

It is necessary to routinely inspect the parts of the camel carcass such as the head, intestines, including the shanks. Through camel meat inspection, conditions that have not been recorded from the discarded camel parts will be observed and documented. Doing so will enrich the disease base data for camels in Kenya and minimize the risks of zoonotic diseases with consumption of camel meat and meat products and enhance their economic importance. 

Although the meat is inspected by both Veterinary and Ministry of Health staff, there is no set code of regulations to follow during the meat inspection (GTZ – KASSIM, 2002, Ministry of Livestock and Fisheries Dev. 2004). Hence, there is inadequate documentation of the pathological affections and diseases of the camel during post mortem camel meat inspection.

The term myiasis was first proposed by Hope (1840), and refers to the conditions in humans and animals caused by infestation by dipteran larvae. Zumpt (1965) defined myiasis as “the infestation of live vertebrate animals with dipterous larvae which at least for a certain period, feed on hosts or living tissues, liquid body substances or ingested food”.

Various forms of myiasis in domestic animals are caused by different species of diptera larvae.

Naso-pharyngeal myiasis which commonly occurs in the one-humped camel is caused by the larvae of the camel nasal bot fly, *Cephalopina titillator*, which is the only species in the old world worms of the genus *Rhinoestrus* (Schwartz and Dioli, 1992, Hall, 2007 and Zumpt, 1965). Naso-pharyngeal myiasis in the camel has been recorded in Somalia where nasophryngeal myiasis is referred to in the local dialect as “sangalale” and Egypt (Sheikh and Mohamud, 2007), but no official records of the condition exist in Kenya.

1.1 Broad objective

**Broad Objective:** To establish the extent of naso-pharyngeal myiasis in slaughtered camels from the ASAL areas of Kenya.
The specific objectives were to determine the prevalence of and pathological effects of the nasal bot fly in slaughtered camels.

**Study area:** A survey was done in the major slaughter slabs in Isiolo, Garissa and Wajir districts.

**Study design:** Qualitative and quantitative. This being a quantitative study, observations, questionnaires, interviews and actual counting of the parasites were done.

**Sampling:** A total of 252 camels were purposively surveyed, of these, 34 camels were slaughtered in Isiolo and 218 in Garissa.

### 1.1.1 Methodology

Traditionally herded slaughter camels aged approximately 1 and 20 years were sampled at the various abattoirs where the study was done. Camel ages were estimated by the owners who traditionally herded them and knew their history. It was not possible use dentition to assess age because the slaughtering of the camels took place in the cooler times of the day between 4.00 and 8.00 am.

Both routine ante-mortem and post-mortem inspections were carried out on the camels to ascertain their wholesomeness.

The routine meat inspection of the camel heads was carried out according to the Meat Control Act (1972). Heads which were discarded by the butchers were placed in one area and inspected examined for *C. titillator.* The heads were placed on the clean floor, the ventral side facing upwards to expose the dorsal surface of the tongue. The root of the tongue was loosened at its basal attachment to the hyoid bone, exposing the larvae in the naso-pharyngeal cavity (Plate 1). Camel nasal bot fly larvae at various stages and sizes in the nasopharyngeal cavity were observed, removed and counted. Photographs of some heads with bot flies were also taken. Larvae were preserved in 10% formalin for further identification.

### 1.1.2 Results

Post mortem findings in the affected heads showed granulation, hemorrhages, ulcers and large amounts of clear mucus in the nasal-pharynx and swellings of the Sub-mandiblar and Retropharyngeal lymph nodes. Sometimes the larvae penetrated the ethnoturbinate bones.

![Figure 1 C.titillator larvae](image)
Various stages and sizes of the larvae were found in the naso-pharyngeal cavity. (See figure 1). The average size of a full grown botfly larva measured 2.5 – 3cm long and 0.5 – 1cm wide. Most of the larvae are firmly attached to the mucosal lining of the nasopharyngeal cavity. The female lays clusters of eggs on the nostrils which later hatch into larvae that migrate to the naso-pharynx and attach on the mucosa. After completing their larval developmental stages in the pharynx, the larvae are ejected out onto the ground by sneezing (Schwartz and Dioli, 1992).

### Sex of Slaughter Animals
- Out of 218 camels slaughtered in Garissa, 62 (28%) camels were females and 156 (72%) camels were males.
- Out of 34 camels slaughtered in Isiolo, 6 (18%) camels were females and 28 (82%) were males.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Age Groups of the Animals Slaughtered in Garissa</th>
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<tbody>
<tr>
<td>Number of Animals</td>
<td>0 – 5</td>
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<tr>
<td>Number of Animals</td>
<td>113</td>
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Most of the camels that were slaughtered were young aged between less than one year to 5 years.

### Clinical Observations
All the slaughter camels were in a good state of body condition. There were no signs of emaciation or affections of the skin such as wounds, alopecia and others (Appendix 1). A study by Chhabra and Pathak (2009) showed that *C. titillator* as a parasite causes limited pathological lesions in the animals it affects and the same can be argued for its public health importance.

### Discussion Conclusion and Recommendation
During the focused group discussion and the administration of questionnaires, most of the participants agreed that camels were the preferred domestic animal. Several reasons were given for the preference, one of them being that camels are resistant to diseases, especially ectoparasites and require little treatment as compared to cattle. However, camels are susceptible to naso-pharyngeal myiasis.
The pastoral communities do not eat camel heads due to cultural practices hence, no keen interest had been developed in thorough examination of the heads during the routine meat inspection. Also due to lack of clear characteristic lesions and disease caused by naso-pharyngeal myiasis, the veterinary clinicians might have paid little attention to the condition. The above suggested reason could have led to the unnoticed and non-recording of the condition in camels. The bones and head skins were disposed off in the open places while the camel bot fly larvae were scrapped off using knives.

The larvae of the camel bot fly fed on the clear mucus and were in a parasitic relationship with the host. One other notable observation is that larvae were able to inflict painful bites on the researchers’ fingers when handling them, and had ability to inflict wounds or damage tissue.

The camel nasal fly has been reported in southern Somalia where it is referred to as “sangaalle” in the local Somalia language (Sheikh and Mohamud, 2007), while in Kenya, the pastoralists in ASAL areas have known the existence of the condition in camels and refer to it by diverse local names: Somali (sangaalle), Boran (shiritho), and Turkana (ekuru). The pastoralists believe that the larvae of the camel bot fly occur naturally in the brain of the camel, and then gradually migrate to the naso-pharynx in mature camels. They are then sneezed out of the nasal cavities because of irritation.

In Somalia, Sheikh and Mohamud (2007) reported that camel naso-pharyngeal myiasis is an emerging killer disease and causes high (100%) mortalities in camels. The effect of the number of larvae on the camels’ health in Kenya has not been documented.

In this study, 100% of the camel heads examined post mortem had camel nasal bots. The findings agreed with the observation of Schwatz and Dioli (1992) and Hall (2007) that the camel nasal bots are common parasites found in ASAL areas where pastoralists keep large numbers of camels.

Three camels each aged one (1) year were sampled and had an average of four (4) bots each. It was therefore observed that the older the animal, the larger the number of larvae it had. The age group of 5 – 10 years had the highest number of naso-pharyngeal larvae of various stages of maturation.

The results showed a direct relationship between the number of the bot fly larvae and the age of the host. The number of camel bot fly larvae in the naso-pharynx increased exponentially with the increase in age of the host then they decreased gradually as the age of the animal advanced. Could it be a case of development of immunity against the parasite?

It was concluded that the camel bot fly is an emerging killer disease of camels and that further studies be done with regard to C.titillator prevalence and appropriate control measures. Since the camel is a very important livestock species with a lot of benefits to the pastoral communities, it is proposed that the prevention and control measures of naso-pharyngeal myiasis be factored into the national livestock programmes, especially those of camel production and health issues.

Research should be carried to identify suitable drugs to treat the condition in the camels in addition even the possibility of developing a vaccine against C. titillator.

Ivomectin (Ivomec ®) has been found to protect camels against gastrointestinal nematodes in dromedary camels, a preliminary study on the efficacy of Ivomectin against natural infection with C.
titillator of the one humped camel (*Camelus dromedarius*) needs to be carried out.

Sheep are affected by Oestrous ovis which infests the nasal cavity of sheep and they also be screened for *C. titillator* since the camel and sheep share similar habitats in the SALs.

The pathological lesions in the Kenyan study were not as severe as those in Arabian study and further research needs to be done to understand the differences in pathologies of *C. titillator* in the different habitats this should include both macroscopic, histopathology and biochemical tests. There is a need to develop and improve diagnosis of the parasite through tests such as PCR which are non invasive.

Researchers, Veterinary staff and Public Health staff should be encouraged to wear gloves when handling camels and their products because of the zoonoses and other health hazards.

**References**