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PREVALENCE, CLINICO-PATHOLOGY AND BIOLOGY OF *Cephalopina titillator* INFESTATION IN CAMELS IN THE ARID REGION OF NORTH-EASTERN, NIGERIA

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ABSTRACT

The prevalence, clinico-pathology and biology of *Cephalopina titillator* infestation (nasal myiasis) among camels (*Camelus dromedarius*) in the arid region of northeastern Nigeria were investigated. The results of the study revealed that out of the 234 camels examined, 200(85.47%) were infested with *Cephalopina titillator* larvae. The predominant clinical signs observed were lacrimation, snorting, serous nasal secretion, sneezing, vigorous shaking of the head and gid like signs. Young camels (<12 months) were significantly ($P<0.05$) more infested than their counterparts, while no statistical variation ($P>0.05$) was observed according to sex. At postmortem, thickening of the oropharyngeal mucosae with petechial haemorrhages were observed. The larvae were found, either attached by oral hooks or embedded in the mucosae. Rarification of various areas of the frontal sinus, nasal septum and cranial cavity were observed. The total mean larval burden of 2,343.2 ± 2.72 due to third larval instars (L3) of *Cephalopina titillator* was encountered for all the predilection sites. In decreasing order 1, 200.24 ± 2.27, 800.20 ± 1.85, 320.23 ± 1.18, 12.21 ± 0.23 and 10.32 ± 0.21 third larval instars (L3) were encountered in the oropharynx, nasal sinuses, frontal sinuses, cranial cavities, and the anterior sub-arachnoid space of the brain, respectively. L3 larvae that were sneezed out produced 23(9.2%) juvenile botflies by day 28.2 ± 0.015 in dry sandy soil, 45(18.0%) in sandy-moist soil by day 25.4 ± 0.015, and 2(0.8%) in loamy soil by day 50.6 ± 0.021. Larval counts were significantly ($P<0.05$) higher during the rainy season (June-September) than the other seasons of the year.

Key words: Biology, camels, clinico-pathology, infestation, prevalence

The arid-zone of north-eastern Nigeria holds the highest concentration of the dromedary camels that are important source of meat, milk, transportation and draught power as well as by – products (wool, hair, skin and hides) (Anon, 1980; Saidu, 1980; Bourn *et al*, 1994). The nasal botfly; *Cephalopina titillator* belongs to the family *Oestridae* (Soulsby, 1982) and is responsible for nasal myiasis in camels (*Camelus dromedarius*) in sub-Saharan Africa (Soulsby, 1982; Nwosu and Wachy, 1998).

The pathogenesis of *Cephalopina titillator* infestation in the host, is directly associated with the life cycle where, adult female flies deposit their young larvae around the nostril of the host, when they crawl upwards into the oropharynx, nasal and frontal sinuses and die following arrested development (Fatani and Hilali, 1994). On the other hand, the larvae may develop rapidly, crawl out of the nostril or are sneezed out and pupate in the soil for 3 – 6 weeks or longer, during the harmatan season, before juvenile flies emerge (Soulsby, 1982; Urquhart *et al*, 1992).

The infestation is associated with irritation in the predilection sites leading to severe nasal secretions, restlessness, 'false gid' or erosions of the bones of the frontal sinuses (Lodha and Chaudhary, 1962; Musa *et al*, 1984). Recently, however, severe outbreaks with high morbidity due to constant irritations produced by the larvae of dipterous flies were observed among camel herds brought for slaughter at the Maiduguri Municipal Abattoir in the arid region of north-eastern Nigeria. This study was therefore, conducted to evaluate the prevalence and for the first time the clinico-pathology and biology of nasal myiasis among camels (*Camelus dromedarius*) in the arid-zone of northeastern, Nigeria.

Materials and Methods

Two hundred and thirty four camels (*Camelus dromedarius*) brought for slaughter at Maiduguri

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municipal abattoir between January and December 2009 were randomly selected and examined anti-mortem for clinical signs and at post-mortem for larval stages and lesions. Prior to slaughter, demographic data such as age, sex and health status of the animals were determined and recorded. Presence or absence of clinical signs of infestation was recorded for each camel. After slaughter, the nasopharynx, nasal sinuses, frontal sinuses and brain were dissected out and routinely examined for myiasis larvae.

The various stages of larvae found in various locations were noted with a view of understanding the biology *in-vivo*. The larvae were collected and stored in 10% formalin and identified using standard methods (Soulsby, 1982), while count was determined as described by Nwosu and Wachy (1998). To study the biology *in-vitro*, two hundred and fifty sneezed out L3 larvae were divided into five groups (A-E) of fifty each. Group A was kept on dry sandy soil, Group B on sandy-moist soil, Group C on clay soil, Group D on loamy soil and Group E in a Petri dish. They were kept in the laboratory at ambient temperature of 37°C in screened boxes to produce adult flies. The mean incubation period per soil type was determined and the juvenile botflies produced were counted (Soulsby, 1982; Urquhart *et al,* 1992).

The adjoining bones and mucosae of the oropharynx and various sinuses (frontal, nasal), cranial cavity and brain were examined for gross changes while lesions encountered were noted. Sections of mucosae of the oropharynx and adjoining sinuses were trimmed within 2 mm of the oral hooks of the larvae. These were fixed in 10% buffered formalin (pH 7.4) then transferred into ascending grades of alcohol and embedded in paraffin wax. Sectioning was carried out at 5µ thicknesses with a rotary microtome, stained with haemotoxylin and eosin (H & E) and examined for lesions (Drury and Wallington, 1976).

The Chi square test X^2 ICC (adjusted for intra-cluster correlation) was used to judge differences in risks between various strata. Differences between the means were determined at 5% level of significance using the analysis of variance (GraphPad Instat, 2000).

Results

The results of the study revealed that out of the 234 camels examined, 200 (85.47%) were infested with *Cephalopina titillator* larvae (Table 1). The predominant clinical signs observed during the anti-mortem examination were lacrimation, occasional snorting, serous nasal secretion, while a few exhibited vigorous shaking of the head, gid and sneezing with restlessness.

The young camels (<12 months) were significantly (P<0.05) more infested with *Cephalopina titillator* larvae than the older camels (>12 months) while no statistical variation (P>0.05) between sexes was observed (Table 1). At postmortem, thickening of the mucosae of the oropharynx and nasal sinuses with petechial haemorrhages and copious amount of blood tinged mucous was observed in all the parasitised camels. Histopathological tissue sections of the mucosae however, did not show significant changes.

Larval counts were significantly (P<0.05) higher during the rainy season (June-September) than during the cold (harmatan months) (November – February) or hot months (April – May) (Fig 1). Either the larvae were, found attached to the mucosae by their oral hooks or both anteriorly and posteriorly or completely embedded (Fig 2). The mean overall larval burden of 2,343.2 ± 2.27 due to third larval instars (L3) were located in decreasing order of intensity from the oropharynx, nasal sinuses, frontal sinuses, cranial cavity and the brain (Table 2). L3 larvae that were sneezed out produced 23 (9.2%) juvenile botflies by

Table 1. The prevalence of *Cephalopina titillator* infestation among camels examined in the arid region of northeastern, Nigeria according to sex and age.

Parameters		*Cephalopina titillator*	
		No. Examined	**No. Infested (%)**
Sex	All sexes	234	200(85.47)
	Males	134	102(43.59)[a]
	Female	100	98(41.88)[a]
Age	All ages	234	200(85.47)
	< 12 months	150	133(56.84)[a]
	> 12 months	84	67(28.63)[b]

Superscripts in columns ([a, b]) differed significantly (P<0.05)

Table 2. Larval burden and stages of *Cephalopina titillator* according to predilection sites in camels examined in the arid region of northeastern, Nigeria.

Predilection sites	Mean larval burden ± S.D and stages of the parasites
All sites	2,343.2 ± 2.27[a](L3)
Oropharynynx	1, 200. 24 ± 2.27[b](L3)
Nasal sinuses	800. 20 ± 1.85[c](L3)
Frontal sinuses	320. 23 ± 1.18[d](L3)
Cranial cavity	12.21 ± 0.23[e](L3)
Brain	10.32 ± 0.21[f](L3)

Superscripts in columns ([a, b, c, d, e, f]) differed significantly (P <0.05)

Keys: L3 = third larval stage

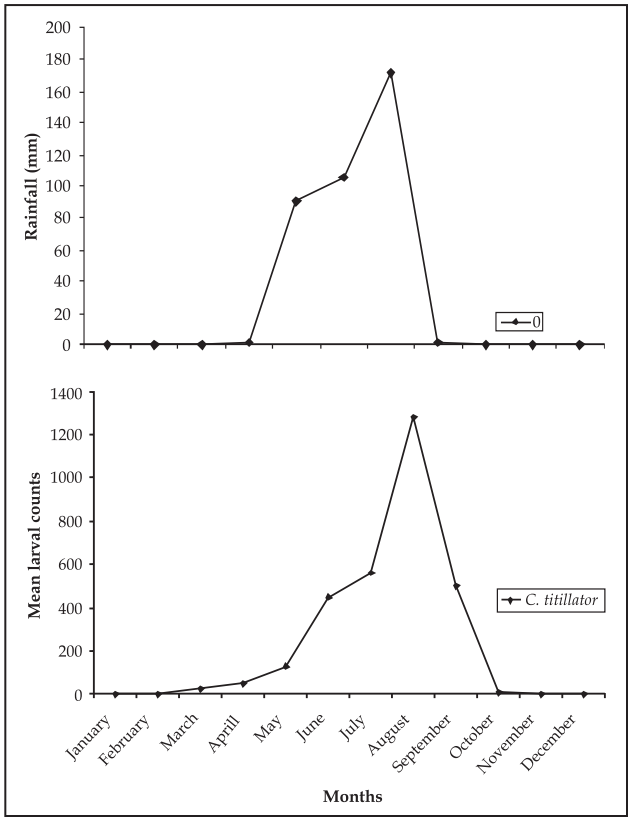

Fig 1. Mean monthly larval counts of *Cephalopina titillator* in relation to rainfall in the arid region of northeastern, Nigeria.

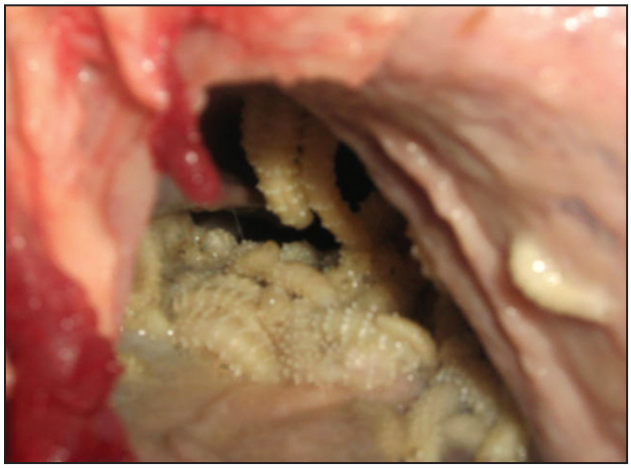

Fig 2. *Cephallopina titillator* larvae in the oropharynx (arrowheads). Note: larvae attached by oral hooks (Long arrow) and embedded both anteriorly and posteriorly (Short arrows). Severe congestion of the oropharynx (round arrow heads).

day 28.2 ± 0.015 in dry sandy soil, 45(18.0%) in sandy-moist soil by day 25.4 ± 0.015, and 2(0.8%) in loamy soil by day 50.6 ± 0.021 (Table 3).

Rarefactions of certain areas of the frontal sinuses, nasal septum and anterior portion of the cranium were also observed at post mortem.

Table 3. The percentage of juvenile botflies of *Cephalopina titillator* recovered fromz different soil types in the laboratory and their incubation periods.

Groups	Soil types	No. of L3 Larvae/ soil	No. of juveniles recovered	Incubation period ± S.D.
A	Sandy/ dry	50	23(9.2%)[a]	28.2 ± 0.015[a]
B	Sandy/moist	50	45(18.0%)[a]	25.4 ± 0.015[b]
C	Clay soil	50	0(0%)[b]	0
D	Loamy soil	50	2(0.8%)[c]	50.6 ± 0.021[c]
E	Control	50	0(%)[b]	0
Total		250	70(28)	104.2 ± 0.51

[a, b, c] Superscripts in columns differed significantly ($p<0.05$).

Discussion

Although decades ago, the prevalence of *Cephalopina titillator* infestation was reported in the arid region of northeastern Nigeria (Nwosu and Wachy, 1998), recent assessment of the situation is lacking. In this study, however, the clinico-pathology of the infestation among slaughtered camels and the biology of the fly under controlled laboratory condition is being reported. These findings are important because, the arid region harbour the highest population of the dromedary camel in Nigeria (Anon, 1980; Saidu, 1980; Bourn *et al,* 1994). The relatively high prevalence of *Cephalopina titillator* infestation among camels in this study was similar to a previous report decade ago in the arid zone of northeastern Nigeria (Nwosu and Wachy, 1998) and in Sudan (Musa *et al,* 1989). The higher prevalence of infestation in the young might be associated with age susceptibility and lack of premunity (Soulsby, 1982). The preponderance of flies observed towards the end of the rainy season with associated humidity might have contributed immensely to the high prevalence of the infestation. Fly activity and survival of the larvae in the environment require moderate temperature and high humidity as obtained in rainy season (Fatani and Hilali, 1994).

In an earlier study conducted by Nwosu and Wachy (1998) in the arid region of northeastern Nigeria, clinical signs were not encountered (Nwosu and Wachy, 1998). In this study, however, 90% of the camels examined during anti-mortem, showed evidence of nasal irritation characterised by profuse nasal secretions, lacrimation, occasional sneezing, vigorous shaking of the head and gid. This was probably associated with irritations produced by the hooks and cuticular spines of *Cephalopina titillator* larvae in the oropharynx and adjoining sinuses. Severe pathogenic effects precipitated by *Cephalopina*

titillator among camels have also been reported in other geographical zones of Nigeria (Husseini *et al*, 1982).

The heavy burden with third larval instars (L3) of *Cephalopina titillator* in the various predilection sites may throw some light on the un-studied biology of the parasites among camels in the arid region of Nigeria. The high larval counts encountered during the rainy season and a significant decline during the cold months is probably associated with the preponderance of dipterous flies during the rainy season and their decline during the cold months. The distribution of the third larval instar L3 for *Cephalopina titillator* was seen in all the predilection sites. This points that they mature all at the same time in the various sites. Hence they begin a downward migration to the nostrils, where they are sneezed out to the ground, pupate and develop between 21 and 28 days. The incidental migration of *Cephalopina titillator* larvae to the cranial cavity and the sub-arachnoid spaces of the brain probably occurred through the several areas of rarefactions connecting the frontal sinuses and the cranial cavity.

Cephalopina titillator infestation occurred with severe clinico-pathological changes among camels in the arid-region of northeastern Nigeria. Similarly, the sandy soil type and rainy season supports the preponderance of the botfly responsible for the infestation in the arid zone. It is therefore, necessary control the adult botflies through application of synthetic pyrethroids in the form of 'long acting pour on' or by strategic larvicidal control through the administration of ivermectin (Ivomec®) particularly the late rainy season when fly activity is at its peak.

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