The Sudan J. Vet. Res. (2006). ***21****: 45-51*
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New Reports for Some Intermediate Hosts of Poultry Tapeworms in Khartoum State.

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ملخص البحث

أجرى بحث للعوائل الطبيعيه الوسيطة للديدان الشريطية فى بعض مزارع الدواجن فى الفترة من 2000–2001 بمنطقتى الحلفايا وشمبات . وقد وجد أن هناك اربعة اجناس من الخنافس تحمل يرقات ديدان شريطية ، أثنان منهن هما الالفيتوبيص ديبرينص (*Alphitobius diaperinus*) والانسيكص فورميكاريس (*Anthicus formicarius*) مصابتان بدودة كوانوتيميا انفندبيوليم (*Choanotaemia infundibulum*) أما الأخيريتان فهما الكارسينوب تروقلودايت (*Carcinops troglodytes*) والهايبوكالكاس بيركوس (*Hypocalccas praecox*)فتحملان يرقات الريليتينا سيستيلص *Raillietina cesticillus* (cysticercoids) بينما حشرة الترابيوليم *(Tribolium castaneum*)البالغة ويرقات الذبابة المنزلية (*Musca domestica* larvae) لاتحملان أى نوع من الاصابة بيرقات الديدان الشريطية. الجدير بالذكرأن هذه الدراسة تسجل لأول مرة أنواع الانسيكص فورميكاريس والكارسينوب تروقلودايت والهايبوكالكاس بيركوس*(Anthicus formicarius, Carcinops troglodytes* and *Hypocalccas praecox)* كعوائل وسيطة تنقل دودتى القوانوتينيا انفندبيوليم و الريليتينا سيستيلص.

Summary

A search for natural intermediate hosts for poultry cestodes was carried out during 2000-2001 in poultry houses at Elhalfaya and Shambat localities in Khartoum State. Four species of beetles were found carrying cysticercoides infections. Two of them namely *Alphitobius diaperinus* (Coleoptera: Tenebrionidae) and *Anthicus formicarius* (Coleoptera: Anthicidae) were infected with *Choanotaenia infundibulum* cysticercoid whereas the other two, *Carcinops troglodytes* (Coleoptera: Histeridae) and *Hypocalccas praecox* (Coleoptera: Histeridae), were found harbouring *Raillietina cesticillus* cysticercoids. No cysticercoids were encountered in adult *Tribolium castaneum* (Coleoptera: Tenebrionidae) or *Musca domestica* larvae (Diptera: Muscidae). This is the first record of *Anthicus formicarius, Carcinops troglodytes* and *Hypocalccas praecox* as intermediate hosts for *Choanotaenia infundibulum* and *Raillietina cesticillus*.

Introduction

Poultry tapeworms with known life history require intermediate hosts for completion of their life cycles. Investigations have invariably shown that intermediate hosts of poultry tapeworms are invertebrates, such as beetles, flies, ants, snails, slugs and crustaceans (Wehr, 1972).

Adult *Musca domestica* has been found to be a natural host for *Choanotaenia infundibulum* (*C. infundibulum)* (Grassi and Rovelli, 1889; Soloviov, 1911; Guberlet, 1919), and the stable fly was claimed to have a role in the transmission of *Hymenolepis carioca* (Guberlet, 1916). In addition, several genera of beetles have been encountered as natural hosts of the poultry cestode *C. infundibulum* (Jones,1930; Horsfall and Jones, 1937; Dutt and Sinha,1961; Dushkin,1970; Elowni and ElBihari, 1979). Beetles are also natural hosts for other poultry tapeworms such as *Raillietina cesticillus* (Dutt *et al.,* 1961) and *H. carioca* (Jones, 1929).

Tapeworms of poultry are common in the Sudan (Abdel-Malik, 1959; Esia *et al*, 1979; Elowni, 1977; Saad *et al*, 1989 and Ali, 1994). Nevertheless, relatively limited research has been done on the local intermediate hosts of chicken tapeworms in the Sudan, despite their importance when constructing a control programme. The objective of this study was to search for potential intermediate hosts responsible for maintaining the life cycle of chickens tapeworms in the Sudan.

Materials and Methods

Collection of insects:

Arthropods were collected from poultry houses at Shambat and Elhalfaya localities during 2000-2001. The poultry facilities from which these arthropods were collected adopted a deep litter system for production of table eggs; except for one house in which two batteries were arranged side by side. Insect samples were collected manually from humid areas underneath the water containers, semi-dry areas under new laid eggs jars and from outside the houses where a lot of droppings was scattered. Cans half-filled with water were embedded in the ground, as pit-fall traps, to trap the creeping and jumping insects. A light trap was also placed inside the pen for collection purpose. A total of 1024 specimens were collected; 321 *Alphitobius diaperinus*, 333 *Tribolium castaneum*, 44 *Musca domestica* larvae and 326 unidentified insects.

Recovery of cysticercoids and preservation:

The arthropods collected were killed in the laboratory by decapitation and placed in either physiological saline or tap water in glass Petri dishes. The chitinous exoskeleton was torn into small pieces under a stereoscopic dissecting microscope. Each piece was agitated with dissecting needle to dislodge any adhering cysticercoid. The cysticercoides recovered were then studied and counted to

evaluate the infection rate, range and intensity. Cysticercoids were then preserved in Zenker̀s solution or 4-5% formalin.

Collected insects exhibiting the potential to natural infection were preserved in screw–capped bottles containing 5% glycerin-alcohol. The area from which the samples were collected, the habitat and the initials of the collector were recorded. Preliminary identification of insects was made to the family level and the specimens were then sent to a reference laboratory (The Natural History Museum, London, United Kingdom) for further identification to species levels.

Results

Dissection of insects in the laboratory revealed the presence of cysticercoids of the cestode *C. infundibulum* in the following arthopods: *A. diaperinus* (Coleoptera: Tenebrionidae) and *A. formicarius* (Coleoptera: Anthicidae) whereas cysticercoids of *R. cesticillus* were detected in *C. troglodytes* (Coleoptera: Histeridae) and *H. praecox* (Coleoptera: Histeridae).

Choanotaenia infundibulum cysticercoids were recovered from *A. diaperinus* and *A. formicarus* in the two areas surveyed. The infection rate with *C. infundibulum* in Shambat and Elhalfaya was 28.33% and 33.59%, respectively. Table 1 shows the prevalence rate of this cestode. Of the 60 *A. diaperinus* beetles, all those infected were among the 50 collected from deep litter. Ten beetles from the battery cage showed no parasitic infection. In Elhalfaya locality, the prevalence rate of the tapeworm *C. infundibulum* infection in the adult beetle *A. diaperinus* differed in the two samples collected.

Infection rate and infection intensity of *C. infundibulum* in *A. formicarus* did not differed greatly with the two management practices though no difference was observed in the number of the infected *A. formicarus* beetles collected from deep litter (20%) and battery cage (2.02%), respectively.

No cysticercoids were recovered from 333 adult *Tribolium castaneum* and 44 *Musca domestica* larvae collected from Shambat locality.

Discussion

The results show an abundance of different species of arthropods inhabiting poultry houses. Chicken litter was highly infested with different types of insects, particularly in badly constructed and poorly managed houses with heaps of droppings around them.

The present results revealed *A. diaperinus* as a natural intermediate host for *C. infundibulum*, which typifies the findings of Elowni and El Bihary (1979). Cysticercoids of *C. infundibulum* were detected in both adult and larval stages, with the highest infection rate being observed in the adult stage. A similar observation was also reported by Elowni and Elbihary (1979). A wide range of infection was observed in this limited survey, 1-209 in Elhalfaya and 1-119 Shambat; and a high number of cysticercoids per infected beetle; 18.6 in Shambat and 12.5 in Elhalfaya.

No early developmental stages of parasites were recovered from intermediate host and almost all cysticercoides were apparently fully mature, with or without capsules. Some of the cysticercoids recovered from *A. diaperinus* varied in size, and appeared dark in colour and this may be due to a reaction developed by this host in response to the parasite presence. Such reactions have been reported to occur commonly in *Coleoptera* (Salt, 1963; Ĝotz and Vey, 1974 ; Vey and Ĝotz, 1975) yet further investigation is required to validate this assumption.

Carcinops troglodytes and *H. praecox* were found to harbour *R. cesticillus* cysticercoids. This represents the first record of beetles of the family *Histeridae* as intermediate hosts of poultry tapeworms in the Sudan.

This is also the first time to record *A. formicarius* (Coleoptera: Anthicidae), *C. troglodytes* (Coleoptera: Histeridae) and *H. praecox* (Coleoptera: Histeridae) as intermediate hosts for poultry tapeworms. Reid (1984) reported that *Carcinops pumilo* acts as intermediate host for *R. cesticillus*. Jones (1929) detected *H. carioca* cysticercoids in Hister (*Carcinops 14 striatus*). Thus, the family *Histeridae* may be responsible for transmitting more than one tapeworm. *A. formicarius* was found harbouring cysticercoids of *C.infundibulum*. Dutt *et al*. (1961) found that members of the same genus act as intermediate host for both *R. cesticillus* and *C. infundibulum*. The importance of these coleopteran beetles in the maintenance of tapeworm infection should be further evaluated. *T. castaenum* was not found to be a natural intermediate host for any of poultry cestodes. This result conforms to

that found by Elowni (1977). The *Musca domestica* larvae were also not found to carry any cestode. For the purpose of control of poultry cestodes, the control of their potential intermediate hosts should be recommended.

Acknowledgments

We are grateful to Prof. M. M. Ahmed, Entomology Department, Agricultural Research Corporation, Ministry of Science and Technology, Sudan, for tentative identification of samples. Thanks are due to the Director of the Central Veterinary Research Laboratories and to the Director General/ Animal Resources Corporation for permission to publish this article.

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Table 1: Prevalence rate of *C. infundibulum* and *R. cesticillus* cesticercoids in naturally infected beetles collected at Shambat and Elhalfaya localities during 2000-2001.

Locality	Species of beetles	No. of beetles examined	No. of beetles infected	Cestodes recovered	Total no of cysticercoids recovered	Mean of cysticercoids recovered
Shambat	*Alphitobius diaerinus*	60(adult)	17(28.33%)	*C. infundibulum*	316(1-119)*	18.6
	Anthicus formicarius	119(adult)	6(5.04%)	*C. infundibulum*	45(2-22)*	7.5
	Hypocalccus praecox	40(adult)	4(10.0%)	*R. cestiillus*	45(3-36)*	11.5
	Carcinops troglodytes	40(adult)	9(22.5%)	*R. cesticillus*	86(1-28)*	9.6
Elhalfaya	*Alphitobius diaperinus*	195(adult)	45(33.59%)	*C. infundibulum*	575(1-209*	12.5
		24(pupae)	1(4.2%)	*C. infundibulum*		
		42(larvae)	2(4.8%)	*C. infundibulum*		

*Range of infection