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Occurrence of Rats and Their Ectoparasites and Cestodes in Some Locations in Nsukka in Eastern Nigeria and the Implications to Human Health

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Abstract: The occurrence of wild rats, their cestodes and ectoparasites in some farms and residential houses in Nsukka was investigated. A total of 101 wild rats were caught using traps and rodenticides. Ectoparasites and cestodes were collected on caught rats. The prevalence of wild rats in the various locations was 100%. Two types of rats identified as *Rattus rattus* (black) and *R. norvegicus* (Norway or brown) rats were caught. The prevalence of black rats (90.1%) was higher than that of the brown rats (9.9%). Fleas identified to be *Xenopsylla* sp. had a prevalence of 43%. However, fleas were not common among rats caught in residential homes. Lice had a prevalence of 7%. The prevalence of cestodes in the rats was 47%. Cestodes were common in both rats caught in the farms and residential houses. Wild rats were very common in some farms and residential houses in Nsukka. Rats served as a medium of transmission of fleas from location to location and can contaminate animal and human feed and water with cestode eggs. It is needful to regularly monitor the occurrence of rats and the parasites and control when their prevalence is soaring since they are zoonotic. Control measures were proposed.

Key words: Occurrence, wild rats, cestodes, ectoparasites, zoonotic

INTRODUCTION

Wild rats are a menace to man and his domestic animals owing to their roles as hosts of endo and ectoparasites and as reservoirs of some diseases and disease agents, disease transmission, transmission of vectors and cause of economic loss in poultries, piggeries and other animal farm units and residential houses (Montes *et al*., 2002). The diseases transmitted by rats are numerous and some of them are either transmitted from rat to rat, rats to other animals or from rats to man. Rats therefore, present a zoonotic threat to the human population in addition to the economic waste it causes. The diseases transmitted by rats include viral, bacterial, protozoal and helminth. Helminth parasites transmitted by rats are numerous but the ones that can be transmitted to man include *Hymenolepis* sp., *Trichinella spiralis* and *Capillaria hepatica* (WHO, 1970; Webster and Macdonald, 1995; Battersby *et al*., 2002; Stojcevic *et al*., 2004; Shatiyyah *et al*., 2012). Arthropods transmitted by rats include fleas and lice (Kia *et al*., 2009). The fleas transmitted by rats from place to place are themselves vectors of some disease agents. For instance, fleas are vectors of several diseases important to human health including plague, murine typhus, and tularaemia. Fleas can also serve as intermediate hosts of several species of tapeworms including species which parasitize humans, dogs and cats (Soulsby, 1982).

There are worries about an increasing rate of emerging and re-emerging zoonoses which have been partly blamed to the alteration in natural habitats of some animals including rodents and rats in particular (Patz *et al*., 2000). The increasing construction of homes, farms, roads and industries in particular has led to the loss of many bushes which serve as natural habitats for most rodents and some of the animals have moved to residential homes and peridomestic locations in search of shelter and food. Rats and other rodents also visit homes, poultries, piggeries and other animal farms in search of warmth, food and shelter and can destroy a lot of feed and equipment including electric wires and this has lead to some electric fires in buildings. Several types of wild rats exist but the two most prevalent ones worldwide are the *Rattus rattus* (black) and the *R. norvegicus* (Norway or Brown) rats (29).

Hymenolepis sp. is one of the important zoonotic helminths that occur in rats (WHO, 1970; Webster and Macdonald, 1995; Battersby *et al*., 2002; Stojcevic *et al*., 2004). The potential risk associated with the existence of infection with the cestode in rats is due to the fact that they can contaminate human food and water with their faeces which may contain infective cestode eggs (WHO, 1970; Soulsby, 1982; Battersby *et al*., 2002). Severe *Hymenolepis* sp. infections cause catarrhal enteritis with signs of anorexia, vomition, diarrhoea and abdominal pain (WHO, 1970; Miyazaki, 1991). Ngongeh *et al*. (2011) have reported a high prevalence of cestodes in reared albino rats and mice (66 and 50%, respectively). Worried by the high cestode prevalence in these laboratory animals, their zoonotic significance and the fear of increasing emerging and re-emerging zoonoses and the fact that the so called wild rats come in contact with the reared rats, visit or live in residential homes and therefore come in contact with man and home rats.

MATERIALS AND METHODS

Study area: The study was conducted in some locations in Nsukka in Enugu state in Eastern Nigeria. These included the poultry, piggery and feed store in the Faculty of Veterinary Medicine (FVM) farm and the animal house in the Department of Veterinary Parasitology and Entomology, University of Nigeria, Nsukka, a private poultry farm and some living houses.

Rats: *Rattus rattus* (black) rat are usually black to light brown with a light underside and have a scraggly coat of black fur and have curved temporal ridges while *R. rattus* (Norway or brown) rat are usually covered with coarse brown fur and have straight temporal ridges (Grzimer, 1990; Avalos and Callahan, 2001). *Rattus rattus* has a tail which is longer than the rest of the body, a slender shaped body, big ears, big eyes and a pointed snout while *R. norvegicus* has a tail which is shorter than the rest of the body, sturdy body, small eyes and ears and a slanted snout.

Rats and parasites recovery: Rats were captured by use of rodenticides, sticky traps and direct hunting from April, 2012 to May, 2013. Each rat was placed in a polythene bag with the mouth tied to avoid escape of ectoparasites from the rats and transferred to the laboratory immediately following recovery to prevent decomposition. In the laboratories the r ats were identified and the ectoparasites were collected following dusting with an acaricide to force arthropods to leave the body of the rats for collection, mounting and identification. The small intestine was harvested and incised longitudinally to recover the cestodes. The cestodes were preserved in 10% formalin for identification and snapping.

Statistical analysis: Data were analysed by means of simple averages and percentages as described in the section faeacal egg and oocysts counts and also by Adeneyi and Oguntunyi (2011).

RESULTS AND DISCUSSION

Two major types of rats were identified at the various locations studied namely, *Rattus rattus* and *R. novergicus* (Fig. 1). The two brown rats on the extreme right of each picture were identified as *R. norvegicus* while the black rats on the left of the pictures were identified as *R. rattus* (Fig. 1). A total of 101 rats were caught and comprised of *R. rattus* which comprised of 91 (90.1%) and *R. norvegicus* 10 (9.9%). The 47 (46.5%) rats were infested with ectoparasites. However, only the *R. rattus* rats were infested with ectoparasites as none of the ectoparasites were recovered from *R. norvegicus*. The 43 (42.6%) of the rats were infested with fleas. Meanwhile, 7 (6.9%) rats were infested with lice. The 47 (46.5%) of rats were infected with cestodes identified to be *Hymenolepis* sp. (Fig. 2). No cestode was recovered from *R. norvegicus.* Some of the rats harboured heavy cestode burdens

(a)

(b)

Fig. 1(a-b): The two types of rats caught in animal farms and living houses in Nsukka (*R. rattus* and *R. norvegicus* on left and right side of each picture)

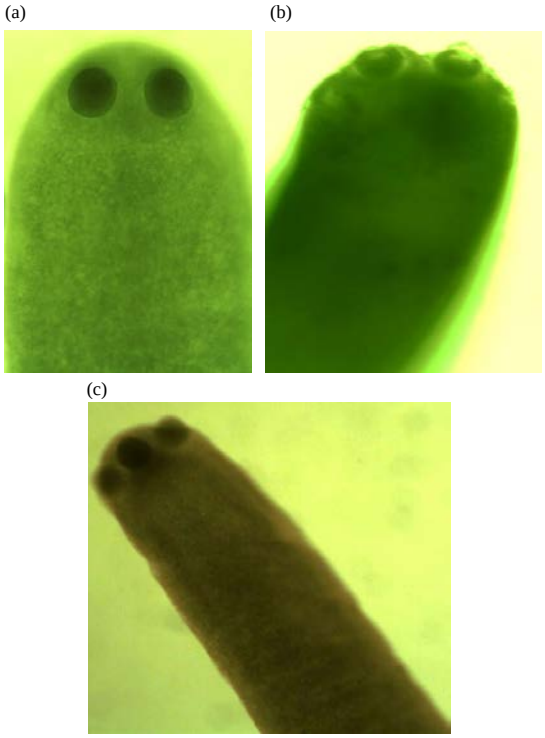

Fig. 2 (a-c): Anterior portions of *Hymenolepis* sp. recovered from caught rats

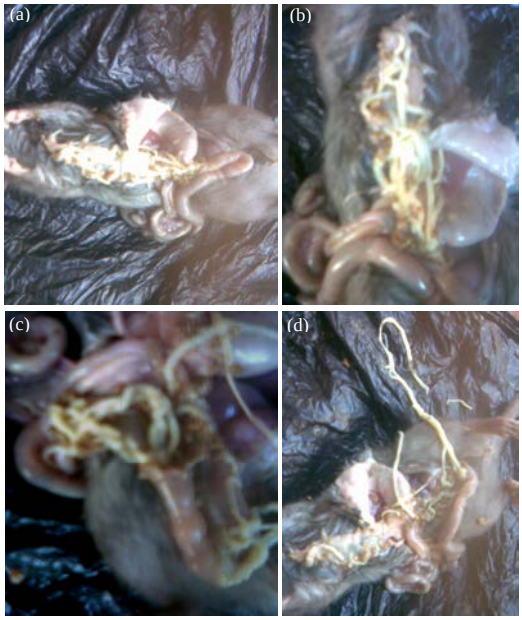

Fig. 3(a-d): Rats showing *Hymenolepis* species in the incised intestine

causing intestinal obstruction (Fig. 3). The 19 (35.2%) and 28 (51.9%) male and female rats, respectively were infected with cestodes. *Rattus norvegicus* did not harbour cestodes. The 2 (8%) and 45 (59.2) of young and adult rats respectively were infected with cesodes. Cestodes and fleas were the most prevalent parasites. Details of the prevalence of parasites are presented on Table 1 and 2. Two rat species namely, *R. rattus* and *R. norvegicus* were found to be common in the study area. However, *R. rattus* was the more dominant species. An earlier study of infestation of domestic premises by the brown rats (*R. norvegicus*). Female rats More female and adult rats were harboured more parasites than male and young rats. Cestodes, fleas and lice were found to be common in poultries, piggeries and residential houses sampled. The 47% prevalence of cestode parasites recorded was high. A high prevalence of natural cestode infections, 66 and 50% has been respectively reported in albino rats and mice reared intensively for research purposes in eastern Nigeria (Ngongeh *et al*., 2011). Both *H. nana* and *H. diminuta* infect rodents, however, *H. diminuta* is said to be more has reported that *R. rattus* was the most common rat species in the tropical area have reported increasing levels common in rats. Although, the

Table 1: Age and sex distribution of parasites recovered from some locations in Nsukka

	Age/sex distribution								
	Young		Adult		Male		Female		
Parasites	No examined	No +ve	No examined	No +ve	No examined	No +ve	Number examined	No +ve	Total infected
Cestode	25	2	76	45	47	19	54	28	47
Fleas	25	5	76	38	47	21	54	22	43
Lice	25	1	76	6	47	2	54	5	7

No = Number; +ve = Positive

Table 2: Occurrence of rats and parasites in some locations

	Number examined					Number infected (%)			
Parasite	Vet farm	VPE	PP	Homes	Total	Vet farm	VPE	KSP	Homes
Cestodes	28	22	37	14	101	11(39.3)	12(54.6)	21(56.8)	7(50)
Fleas	28	22	37	14	101	18 (64.3)	10 (35.7)	13(46.4)	0(0)
Lice	28	22	37	14	101	8 (28.6)	8 (28.6)	6 (21.4)	0 (0)

PP = Private Poultry

tapeworms, *H. nana* and *H. diminuta* and the metacestodes of *Taenia pisiformis* and *Multiceps serialis* all infect man, hymenolepiasis is more frequently reported in children. However, unlike in the current study in which the prevalence was based on post mortem worm counts, the study of Ngongeh *et al*. (2011) was based on faecal egg counts. Onyenwe *et al*. (2009) have also reported the prevalence of cestodes in local house rats (*R. rattus*) in Nsukka although the prevalence (19.5%) in that study was low in comparison to the 47% recorded in the current study. The prevalence of cestodes in the work of Onyenwe *et al.* (2009) was also based on post mortem worm counts. Onyenwe *et al.* (2009), however also reported the occurrence of *Capillaria hepatica* in the rats, although, they did not examine the rats for ectoparasites. The three results are comparable and point to the fact that the zoonotic Hymenolepis is widespread in both wild and domestic rats. However, not only the prevalence of *R. norvegicus* was low, it was found to harbour no cestodes, fleas and lice in this study.

Fleas were significantly common in *R. rattus* in all the accommodations sampled, although they tended to be more common in the farms than in the living houses. This may be because the rats can readily access feed in farms and lesser attention might have been paid in controlling rats in the animal units than those in the living homes. Rat fleas seemed to be more common in the wild rats when compared to that in albino rats based on the results obtained in the study of Ngongeh *et al*. (2011). Recently, there was an outbreak of fleas in the Faculty of Veterinary Medicine farm in the University of Nigeria, Nsukka where many of the rats in this study were obtained. This coincided with a high prevalence of rats in the farm. Incidentally the rats were highly infected with fleas which were diagnosed to be the rat flea (*Xenopsilla* sp). Workers in the farm and most visitors to the farm were infested with fleas once they entered to the animal houses and their surroundings in the farm. Fleas infested me each time I visited the farm to collect rats. There was a high intensity of fleas on the rats that were caught in the farm within a period of 3 weeks of the flea and rat outbreak in the farm. A lot of the rats that were caught showed clinical signs of allergic flea dermatitis. Most of the rats in that farm during the period were caught and this was followed by a decline in the fleas and it was highly believed that the rats acted as a medium in the spread of the fleas. Goats in the farm were found to harbour the same species of fleas, a situation which often occurs in which fleas infest hosts other than their natural hosts. In another major poultry farm sampled in Nsukka town, fleas were also common but at a lower rate. However, most of the rats from living houses did not harbour fleas and this may be attributable to good residential hygiene.

The high prevalence of cestodes and fleas in rats is significant in that fleas serve as intermediate hosts for the cestodes and this might have enhanced the high infection rate of cestodes in the rats. Rats therefore play a significant role in spreading fleas and other ectoparasites in an environment and from one environment to the other. Therefore, rats can indirectly transmit the diseases normally transmitted by the ectoparasites by way of transporting the ectoparasites which serve as vectors or reservoirs of the aetiology of such diseases. By visiting and/or living in homes, rats constitute a zoonotic threat to humans by contaminating human food and water with their faeces which may contain cestode eggs. People can also contaminate themselves by failing to observe some hygiene either during or after slaughtering rats for their food or other purposes. Handlers of albino rats and mice have been warned of the impending danger of infecting themselves with cestode eggs if they fail to observe personal hygiene such as washing of hands after handling cestode infected animals (Ngongeh *et al*., 2011). Vegatables from farms fertilized with rat and mouse manure are also likely to be contaminated with *Hymenolepis* eggs (Ngongeh *et al*., 2011).

Previous studies have mentioned the importance of rats in transmission of leptospirosis (Montes *et al*., 2002) and as agents of helminth, protozoal, bacterial and rickettsial diseases. It is now known that rodents transmit the much dreaded lassa fever through contamination of the environment with urine and faeces of infected animals (Werner, 2004). With zoonotic potential of cestodes and the fear of increasing emerging and re-emerging zoonoses, the current study seemed to suggest the importance of monitoring and controlling rat prevalence and the regular assessment and monitoring of infections harboured by rats that constitute zonooses. Ngongeh *et al*. (2011) have pointed at the possible dangers facing handlers and users of albino rats and mice of the risk of contracting infections with the zoonotic *Hymenoleps* sp. Prevalence of zoonotic microorganism in house rat (*R. rattus*) and house mouse (*Mus. musculus*) in different types of structures such as grocery shops, sweet shops, rice godowns, wheat godowns and poultry feed stores was studied in Sargodha and Faisalabad districts of Pakistan with *Hymenolepis* being the most prevalent in rice godowns (3.61%) and lowest in sweet shops (3.0%). However, the prevalence rates in the Pakistan study is far lower than in the current study, although the examinations were carried on collected rat faeces in the different locations rather than post mortem worm counts as conducted in the current study. Kia *et al*. (2009) have also reported the highest prevalence in fleas of all the arthropods examined in captured rats and a least prevalence in lice. However, contrary to the findings in this study *R. norvegicus* was higher in prevalence in the study conducted in Bandar Abbas in Southern Iran.

Wild rats (*R. rattus* and *R. norvegicus*), *Hymenolepis* sp. and *Xenopsylla* sp. were highly prevalent in the study

area. Both rats and the parasites are either important as zoonoses or in the transmission of zoonoses. Being of public health importance, rats should be regularly monitored and controlled especially when in high numbers and when they are found to harbour zoonotic parasites or parasites that can serve as vectors for zoonotic diseases.

Rats can be kept to the barest minimum in farms and residential homes by adopting the following controlling measures: By keeping foods and food materials in metal containers with good covers or in concrete rooms devoid of holes and cracks with well flushed doors with no openings for rats, sealing of all perceivable holes in farms and living buildings, avoidance of stacking outdated feeding containers and drinkers and other rubbish in homes, peridomestic homes and farms, avoidance of grown bushes around houses and farms, avoidance of stacking of litter close to buildings, regular use of traps, rodenticides and cats to eliminate rats, regular screening and treatment of reared rats against endo and ecto-parasites, regulars treatments of domestic animals against ecto and endo-parasites. This will also delay or reduce the rate of emerging and re-emerging zoonoses.

CONCLUSION

The present study was therefore carried out to investigate the following: to establish the prevalence of cestodes, fleas, lice and other ectoparasites on the rats. To establish the prevalence of rats in homes and farms. To establish the common types of rats in the study area and to propose control measures for rats thereby preventing economic waste and reducing the risk of contracting zoonoses.

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