

PREVALENCE OF ZONOTIC HELMINTHS IN LOCAL HOUSE RATS (*Rattus rattus*) IN NSUKKA, EASTERN NIGERIA

¹ONYENWE, Ifediora Walter, ²IHEDIOHA, John Ikechukwu and ¹EZEME, Rita Ifeoma

¹Department of Veterinary Parasitology and Entomology, University of Nigeria, Nsukka, Enugu State, Nigeria.

²Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria.

Corresponding Author: Ihedioha, J. I. Department of Veterinary Pathology and Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria. **Email:** jiferh@yahoo.com **Phone:** +234 8051369936

ABSTRACT

The occurrence of zoonotic helminths in house rats (Rattus rattus) constitute serious public health risks as these rats commonly cohabit with humans, and are known to be natural reservoirs of some helminth infections of public health importance. This study surveyed the prevalence of the three major zoonotic helminths (Capillaria hepatica, Hymenolepis spp and Trichinella spiralis) in house rats in Nsukka, Eastern Nigeria. A total of 103 house rats were trapped and screened for the three zoonotic helminths. Whole liver of each R. rattus was sectioned into small bits and examined for the presence of C. hepatica nodules/granuloma, while faecal samples collected from the rectum of the trapped rats were screened for worm eggs by the simple floatation technique, and diaphragmatic muscle sections were examined microscopically for the presence of T. spiralis larvae. Results showed that out of the 103 rats screened, 5.8% were infected with C. hepatica, 19.5% with Hymenolepis spp, and none (0%) with T. spiralis. The prevalence of C. hepatica in relation to sex and age of the rats was found to be 2.9% for males, 7.4% for females, 0% for young rats and 7.8% for adult rats, while that of Hymenolepis spp in relation to sex and age of R. rattus was 20% for males, 16.2% for females, 0% for young rats and 23.4% for adults. The prevalence obtained in this study was compared with those reported in literature for other locations. The occurrence of C. hepatica and Hymenolepis spp in R. rattus surveyed was considered to be of immense public health significance because of the detrimental pathologies the helminths cause in humans who easily get infected as the rats cohabit the homes/houses where humans live.

Keywords: Prevalence, Zoonotic helminths, *Capillaria hepatica*, *Hymenolepis* spp, *Trichinella spiralis*, *Rattus rattus*

INTRODUCTION

There are three major zoonotic helminths of public health importance that occur in house rats – *Capillaria hepatica*, *Hymenolepis* spp and *Trichinella spiralis* (WHO, 1970; Webster and Macdonald, 1995; Battersby *et al.*, 2002; Stojcevic *et al.*, 2004). The potential risk associated with the existence of infection in house rats arises from the fact that these rats commonly co-habit human homes and habitations and there is the possibility of contamination of food and water of humans (WHO, 1970; Battersby *et al.*, 2002).

Capillaria hepatica is habitually found in the liver of rats, mice, cats, dogs, pigs and monkeys, with humans as accidental hosts (Belding, 1965; Lloyds *et al.*, 2002). Human *C. hepatica* infections occur by the consumption of food or water contaminated with embryonated eggs previously released from rat liver through cannibalism, predation or decomposition of carcasses (Stojcevic *et al.*, 2004). *C. hepatica*

infections in humans are associated with hepatic necrosis, parasitic hepatitis, hepatic fibrosis, persistent fever, hepatomegaly and eosinophilia (Pannenbecker *et al.*, 1990; Govil and Desai, 1996; Sawamura *et al.*, 1999). *Hymenolepis* spp is the dwarf tapeworm of rats that infects humans when food contaminated with rat faeces containing viable eggs are ingested (Soulsby, 1982). A heavy human infection with *Hymenolepis* spp causes catarrhal enteritis with signs of anorexia, vomiting, diarrhoea and abdominal pain (WHO, 1970; Miyazaki, 1991). *Trichinella spiralis* adults are found in the small intestines and their larvae in striated muscles of its common hosts – pigs, rats and humans (Urquhart *et al.*, 1987). Heavy human *T. spiralis* infections are associated with enteritis, and after 1 – 2 weeks, the massive larval invasion of muscles cause acute myositis, fever, eosinophilia and myocarditis (Rey, 1991).

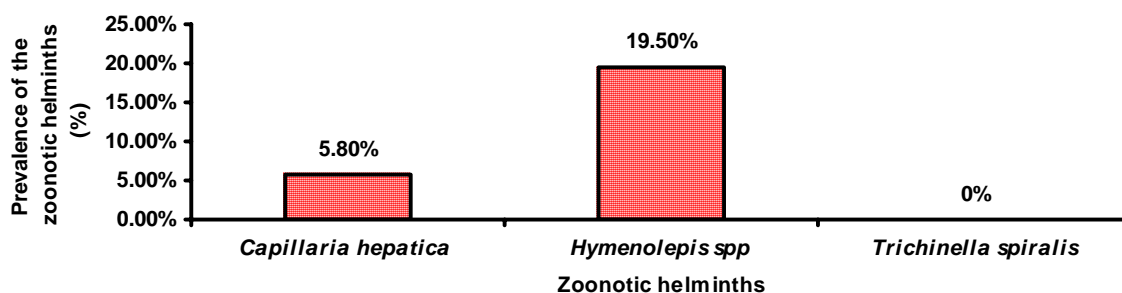


Figure 1: Prevalence of the three major zoonotic helminths in house rats in Nsukka, Eastern Nigeria

Reports from available literature had shown variable prevalence of these zoonotic helminths obtained from different parts of the world (Seong *et al.*, 1995; Webster and Macdonald, 1995; Yen *et al.*, 1996; Davoust *et al.*, 1997; Stojcevic *et al.*, 2004), including Western Nigeria (Acinboade *et al.*, 1981; Mafiana *et al.*, 1997), but there had been no report on the prevalence of these helminths in *R. rattus* of Eastern Nigeria. Some of the earlier studies had partly attributed the variations in prevalence obtained in different geographical locations to climatic and other environmental factors (Battersby *et al.*, 2002; Stojcevic *et al.*, 2004). The present study was therefore designed to survey the prevalence of the three major zoonotic helminths in house rats in Nsukka, Eastern Nigeria, and also to establish the relationship between age and sex of the rats and the infection prevalence.

MATERIALS AND METHODS

A total of 103 house rats were trapped in and around randomly selected homes in Nsukka, Eastern Nigeria between May and August 2007. The trapped rats were brought to the Department of Veterinary Parasitology and Entomology Laboratory, University of Nigeria, Nsukka. They were identified and classified as either young or adult based on their body weight and length (Stojcevic *et al.*, 2004). Those trapped alive were humanely sacrificed by exposure to chloroform in a chamber. Faecal pellets were collected from the rectum of the rats and examined by simple floatation technique for helminth ova (MAFF, 1971). The small intestine of each of the rats was longitudinally incised, opened and the contents washed with normal saline into Petri dishes and adult *Hymenolepis spp* and *T. spiralis* were searched for using a stereomicroscope. The liver of each rat was sectioned into bits of 2 mm thickness and examined for *C. hepatica* nodules/granulomas. One gramme of the diaphragmatic muscle of each rat was flattened between two slides and examined

under X40 magnification for *T. spiralis* larvae (Urquhart *et al.*, 1987). All parasites recovered were identified by their distinctive characteristics (Soulsby, 1982).

Results obtained were subjected to Chi square and Fisher exact test as appropriate and the prevalence were presented as percentages.

RESULTS

The 103 rats trapped were composed of 35 males and 68 females; 26 were young while 77 were adults. The overall prevalence of *C. hepatica* in the trapped rats was 5.8% (6 out of 103), that of *Hymenolepis spp* was 19.5% (18 out of 103), while that of *T. spiralis* was 0 % (0 out of 103) (Figure 1). When sorted based on sex and age, the prevalence of *C. hepatica* in males was 2.9 % (1 out of 35) and in females 7.4 % (5 out of 68), while for young rats the prevalence was 0 % (0 out of 26) and for adult rats it was 7.8 % (6 out of 77) (Figure 2). These differences in *C. hepatica* prevalence between the sexes and age groups were not found to be statistically significant ($p > 0.05$). For *Hymenolepis spp*, sorting according to sex showed a prevalence of 20% in males (7 out of 35) and 16.2 % (11 out of 68) in females, while sorting for age gave a prevalence of 0 % (0 out of 26) for young rats and 23.4 % (18 out of 77) in adult rats (Figure 3). The difference in the prevalence of *Hymenolepis spp* between the sexes was not found to be statistically significant ($p > 0.05$), but the prevalence in adult rats was found to be significantly higher ($p < 0.01$) than the prevalence in young rats.

DISCUSSION

The prevalence of 5.8 % for *C. hepatica* in the present study was relatively low when compared to reported prevalence of 23 % (Webster and McDonald, 1995), 36 % (Ceruti *et al.*, 2001), 44% (Davoust *et al.*, 1997) and 75 % (Farhang-Azad,

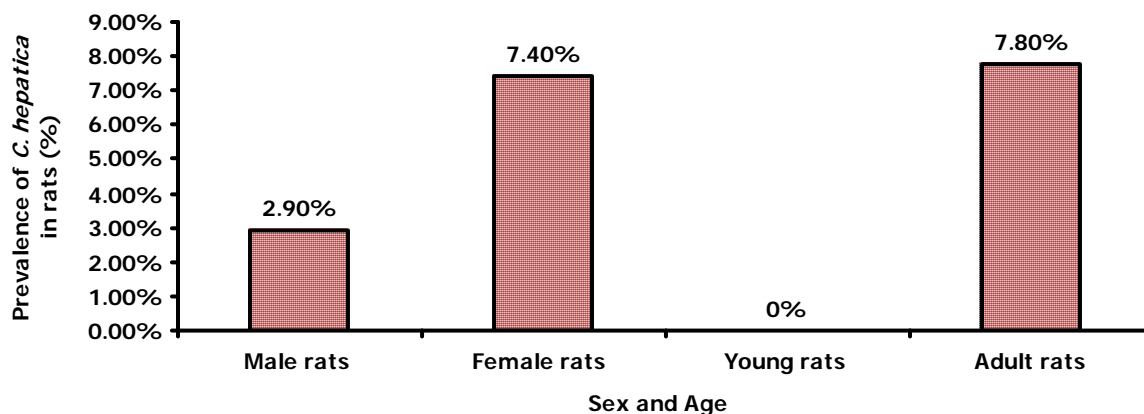


Figure 2: Sex and age variations in the prevalence of *Capillaria hepatica* in house rats in Nsukka, Eastern Nigeria

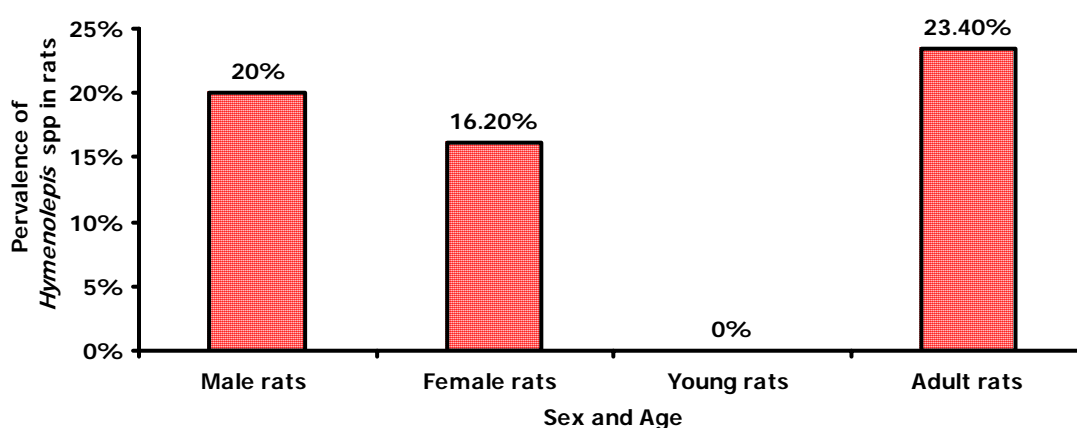


Figure 3: Sex and age variations in the prevalence of *Hymenolepis* spp in house rats in Nsukka, Eastern Nigeria

1977), but higher than the 0.39 % reported by Stojcevic *et al.* (2004) and 2.5 % reported by Battersby *et al.* (2002). It seemed that Nsukka being a sub-urban area has a prevalence lying between the relatively low prevalence reported in literature for surveys carried out in rural areas and the high prevalence reported for surveys carried out in urban areas. For *Hymenolepis* spp, our finding in the present study of 19.5 % prevalence was nearly in agreement with that of 17.5 % reported by Battersby *et al.* (2002), but relatively lower than 32.6 % reported by Seong *et al.* (1995), 33 % by Webster and Macdonald (1995) and 36.9 % by Stojcevic *et al.* (2004); and higher than 6.1% reported by Seo *et al.* (1968). The 0 % prevalence of *T. spiralis* in *R. rattus* in this present study in Nsukka is noteworthy. Though there were no surveys of *T. spiralis* in house rats in available literature to compare, reports in literature of surveys on rat populations in pig farms showed high prevalence of 21.4 % (Hurnikova *et al.*, 2005) and 42.4 % (Leiby *et al.*, 1990). The 0 % prevalence recorded in this study may not be unconnected with

the fact that pigs are not commonly reared as household domestic animals in Nsukka area – most of the pig farms are independently located farms not closely attached to human homes.

All the rats that were positive for *C. hepatica* and *Hymenolepis* spp in the present study were adult rats. Significantly higher prevalence of *Hymenolepis* spp in older (adult) rats had earlier been reported (Webster and Macdonald, 1995; Mafiana *et al.*, 1997; Stojcevic *et al.*, 2004). The higher prevalence of *C. hepatica* and *Hymenolepis* spp in adult rats in the present study is attributable to the relatively longer exposure of the adult rats to chances of infection than the younger ones.

The occurrence of *C. hepatica* and *Hymenolepis* spp in the house rats surveyed is considered to be of public health significance because of the detrimental pathologies associated with human infections, and humans easily get infected with these helminths as the rats co-habit their homes, and for *C. hepatica*, it is noteworthy that the first reported

human case in West Africa was in a Nigerian woman (Attah *et al.*, 1983).

REFERENCES

- ACINBOADE, O. A., DIPEOLU, O. O., OGUNJI, F. O. and ADEGOKE, G. O. (1981). The parasites obtained and bacteria isolated from house rats (*Rattus rattus* Linnaeus, 1758) caught in human habitations in Ibadan, Nigeria. *International Journal of Zoonoses*, 8: 26 – 32.
- ATTAH, E. B., NAGARAJAN, A. S., OBINECHE, E. N. and GERA, S. C. (1983). Hepatic capillariasis. *American Journal of Clinical Pathology*, 79: 127 – 130.
- BATTERSBY, S. A., PARSONS, R. and WEBSTER, J. P. (2002). Urban rat infestations and the risk to public health. *Journal of Environmental Health Research*, 1: 57 – 65.
- BELDING, D. L. (1965). *Capillaria hepatica*. Pages 402 – 403. In: *Textbook of Parasitology*, 3rd edition. Appleton-Century-Crofts, New York.
- CERUTI, R., SONZOGNI, O., ORIGGI, F., VEZZOLI, F., CAMMARATA, S. GUISTI, A. M., and SCANZIANI, E. (2001). *Capillaria hepatica* infection in wild brown rats (*Rattus norvegicus*) from the urban area of Milan, Italy. *Journal of Veterinary Medicine, B: Infectious Diseases and Veterinary Public Health*, 48: 235 – 240.
- DAVOUST, B., BONI, M., BRANQUET, D., DUCOS DE LAHITTE, J. and MARTET, G. (1997). Research on three parasitic infestations in rats captured in Marseille: evaluation of the zoonotic risk. *Bulletin of the National Academy of Medicine*, 181: 887 – 897.
- FARHANG-AZAD, A. (1977). Ecology of *Capillaria hepatica* (Bancroft, 1893) (Nematoda). 1. Dynamics of infection among Norway rat populations of the Baltimore Zoo, Baltimore, Maryland. *Journal of Parasitology*, 63: 117 – 122.
- GOVIL, H. and DESAI, M. (1996). *Capillaria hepatica* parasitism. *Indian Journal of Paediatrics*, 63: 698-700.
- HURNIKOVA, Z., SNABEL, V., POZIO, E., REITEROVA, G., HRCKOVA, D., HALASOVA, D. and DUBINSKY P. (2005). First record of *Trichinella pseudospiralis* in the Slovak Republic found in domestic focus. *Veterinary Parasitology*, 128: 91 – 98.
- LEIBY, D. A., DUFFY, C. H., MURRELL, K. D. and SCHAD, G. A. (1990). *Trichinella spiralis* in an agricultural ecosystem transmission in the rat population. *Journal of Parasitology*, 76: 360 – 364.
- LLOYDS, S., ELWOOD, C. M. and SMITH, K. C. (2002). *Capillaria hepatica* infection in a British dog. *Veterinary Record*, 151: 419 – 420.
- MAFF (1971). *Ministry of Agriculture, Fisheries and Food (MAFF) Technical Bulletin No. 18 – Manual of Veterinary Parasitology Laboratory Technique*, Her Majesty's Stationery Office, UK.
- MAFIANA, C. F., OSHO, M. B. and SAM-WOBO, S. (1997). Gastrointestinal helminths parasites of the black rat (*Rattus rattus*) in Abeokuta, Southwest Nigeria. *Journal of Helminthology*, 71: 217-220.
- MIYAZAKI, I. (1991). *An Illustrated Book of Helminthic Zoonoses*, International Medical Foundation of Japan, Tokyo.
- PANNENBECKER, J., MILLER, T. C., MULLER, J. and JESCHKE, R. (1990). Severe liver involvement by *Capillaria hepatica*. *Monatsschr Kinderheilkd*, 138: 767-771.
- REY, L. (1991). *Trichuris*, *Trichinella* e outros nematoides. Pages 565 – 571. In: *Parasitologia*, 2nd edition, Rio de Janeiro, Brazil.
- SAWAMURA, R., FERNANDES, M. I. M., PERES, L. C., GALVAO, L. C., GOLDANI, H. A. S, JORGE, S. M., ROCHA, G. M. and SOUZA, N. M. (1999). Hepatic capillariasis in children: Report of 3 cases in Brazil. *American Journal of Tropical Medicine and Hygiene*, 61: 642 – 647.
- SEO, B. S., RIM, H. J., YOON, J. J., KOO, B. Y. and HONG, N. T. (1968). Studies on the parasitic helminths of Korea. III. Nematodes and cestodes of rodents. *Korean Journal of Parasitology*, 6: 123 – 131.
- SEONG, J. K., HUH, S., LEE, J. and OH, Y. (1995). Helminths in *Rattus norvegicus* captured in Chunchon, Korea. *Korean Journal of Parasitology*, 33: 235 – 237.
- SOULSBY, E. L. J. (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals*, Bailliere Tindall and Cassell, London.
- STOJCEVIC, D., MIHALJEVIC, Z. and MARINCULIC, A. (2004). Parasitological survey of rats in rural regions of Croatia. *Veterinary Medicine - (Czech)*, 49: 70 – 74.
- URQUHART, G. M., ARMOUR, J., DUNCAN, A. M., DUNN, J. L. and JENNINGS, S. W. (1987). *Textbook of Veterinary Parasitology*, Longman, United Kingdom.

- WEBSTER, J. P. and MACDONALD, D. W. (1995). Parasites of wild rats in UK. *Parasitology*, 111: 247 – 253.
- WHO (1970). *Parasitic zoonosis*. World Health Organization (WHO), Technical Report Series 637, WHO, Geneva.
- YEN, C. M., WANG, J. J., LEE, J. D., CHEN, Y. P. and CHEN, E. R. (1996). Parasitic infections among wild rats from two areas of Kaohsiung. *Kaohsiung Journal of Medical Science*, 12: 145 – 149.