Global Veterinaria 6 (6): 547-550, 2011
ISSN 1992-6197

A Report over the Infection with the Louse *Polyplax spinulosa* in Typical Rats Belonging to the Wistar Strain Kept in the Laboratory Animal Breeding and Keeping Center of Urmia University

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Abstract: In this study, a total of 150 rats were examined to evaluate the extent to which they were infected with ectoparasites. The rats were categorized into three age groups: less than 6 weeks of age, 6-12 weeks of age and more than 12 weeks of age. The animals were selected at random from the rat colonies available in the Laboratory Animal Breeding and Keeping Center of Urmia University. The number of male and female rats was equal. A total of 12 rats (8%) had been infected with the louse *Polyplax spinulosa*. Except for the mentioned louse, no other ectoparasites were isolated from any rats. The results obtained from the study indicated a significant difference in the level of infection with ectoparasites in different age groups ($p<0.05$), while no difference was observed between males and females ($p>0.05$). Signs including mucous pallor, itching, hair loss and emaciation were seen in 33.3%, 83.3%, 50% and 41.6% of the infected rats respectively.

Key words: Rat · *Polyplax spinulosa*

INTRODUCTION

Ectoparasite is referred to a living organism which settles on the body's external surface of other organisms temporarily or permanently, feeding on them and inflicting damage [1]. Ectoparasites include insects and acarines (fleas and mites) [1, 2]. Some of them, like lice, are permanent parasites while most of the mature ticks and fleas are temporary parasites [3].

Some of the ectoparasites can biologically or mechanically transfer infectious agents to the human or animals and result in the spread of infection [2, 4-6]. The level of infection intensity and activity of these vectors depend on some factors such as the abundance of various hosts, environmental conditions and locomotion [7].

Injuries resulting from the ectoparasites are contingent upon the number of the parasites, the area of infection, the method of feeding and the host's immune reaction [8]. The presence of parasites on the skin can stimulate keratinocytes and consequently result in the release of cytokines like interleukin 1 which leads to hyperplasia of skin or cutaneous inflammation. Antigens and anticoagulants in the saliva of the bloodsucking parasites can results in allergic reactions and multiplication of hypersensitivity [9, 10]. Infection with bloodsucking ectoparasites may bring about anemia. Although each parasite feeds on a small amount of its host's blood, on the larger scale it can be weakening. So anemia is prevalent in the hosts highly infected [9].

Some reports have been published so far on the infection of rats and other rodents with ectoparasites

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[2, 11-13]. Given to the widespread use of rats in laboratories and biological research institutes, infection of these animals with ectoparasitic agents such as mites, ticks, lice and fleas can pose many risks to the laboratorial groups. Among examples in this field are *Xenopsylla cheopis* and *Nosopsyllus fasciatus* fleas, which are the most important contributing factors in transferring bubonic plague to the human [9, 14]. The louse *Polyplax spinulosa* can play a role as a carrier of murine typhus and zoonotic diseases to the human [15]. It is also responsible for the transmission of Haemobartonella muris and Rickettsia typhi among rats [7, 16]. *Polyplax spinulosa* belongs to the order phthiraptera, the suborder anoplura and the genus Polyplax. The louse has five-segmented antennae and they have no eyes or eye spots. The front legs are small, but the hind legs are large and have nails and tibial spurs. Also, there is an abdominal sternite on the breast's ventral surface.

The objective of this study was to determine the kind and level of infection with the Polyplax louse in rats.

MATERIALS AND METHODS

Studied Rats: To implement this plan, a total of 150 typical rats belonging to the Wistar strain available in the Laboratory Animal Breeding and Keeping Center of Urmia University were selected randomly. They were in the age groups of less than 6 weeks, 6-12 weeks and more than 12 weeks. The number of male and female rats was equal. The rats were kept on a straw floor in colonies each of which consisted of 8-10 animals. All rats were provided with the same living and nutritional conditions, through the period from September 23rd to February 19th 2008.

Isolation of Ectoparasites: First, different areas of the body's external layer were examined and evaluated for each rat by a manual magnifying glass (magnification of 4x) while brushing the fur in opposite direction. If an ectoparasite was spotted it would be removed by a forceps and transferred into a container containing 70% ethanol. Then, transparency, dehydration and fixation were performed and samples were held between a microscope slide and a cover slip. Finally, the definite diagnosis of ectoparasites, through an optical microscope (magnification of 4-40×), was established regarding the morphological specifications of them [9, 16, 17].

Clinical Examinations: Any rats infected with ectoparasites underwent accurate examinations and the observed clinical symptoms were registered and written down. To that end, each studied rat would be placed in a special cage and odd behaviors such as itching and restlessness would be examined in given times. Also the animal's health was studied, in terms of weight, the concentration of fur and the color of the mucus.

Method of Statistical Calculations: The obtained data were analyzed through the SPSS 11.5 statistical software and the Chi square test and the relation between the infection with ectoparasites and age and gender was determined. If $p \leq 0.05$, the relation would be considered to be significant.

RESULTS

Statistical Results: The total of 12 (8%) of the 150 studied rats were infected with the louse *Polyplax spinulosa*. Except for it, no other ectoparasites were isolated from the rats. The least number of isolated lice from a rat was 3 and the most was as many as 100.

Data analysis indicated a significant difference in the level of ectoparasitic infection between different age groups ($p \leq 0.05$). But no tangible difference was observed in the occurrence of infection between males and females ($p \leq 0.05$). Table 2 and table 3 represent respectively the level of infection with the louse *Polyplax spinulosa* in the male and female rats and in different age groups.

Table 1: The intensity of infection of rats with the louse *Polyplax spinulosa* in males and females.

	Type		
Gender	Infected	Non infected	Total
Male	6(8%)	69(92%)	75(50%)
Female	6(8%)	69(92%)	75(50%)
Total	12(8%)	138(92%)	150(100%)

Table 2: The intensity of infection of rats with the louse *Polyplax spinulosa* in different age groups

	Type		
Age (week)	Infected	Non infected	Total
6>	0(0%)	50(100%)	50(33.33%)
6-12	2(4%)	48(96%)	50(33.33%)
12<	10(20%)	40(80%)	50(33.33%)
Total	8(12%)	138(92%)	150(100%)

Table 3: The observed clinical signs and symptoms in rats infected with the louse *Polyplax spinulosa*

Clinical signs	Number	%
Paleness	4	33.3%
Urticarial	10	83.3%
Calvities	6	50%
Thinness	5	41.6%

Clinical Findings: The results obtained from the clinical examination of rats infected with the louse *Polyplax spinulosa* are represented in Table 3.

DISCUSSION

In this research, 8% of the studied rats had been infected with ectoparasites, with the only isolated ectoparasite being the louse *Polyplax spinulosa*. It is a kind of sucking louse which feeds on blood. The parasite has a bright color and its head is narrower than its breast. The oral appendixes had been adapted to suck the rat's blood [17].

In a study conducted by Soliman *et al.* (2001) in Egypt, 40.1%, 31% and 28.9% of the total ectoparasites isolated from the typical rats were lice, flea and mite respectively and the most isolated parasite was the louse *Polyplax spinulosa* [11]. Also, in a study conducted by Stojcevic *et al.* (2004), 32.2% of the rats had been infected with ectoparasites and the louse *Polyplax spinulosa* was the most prevalent compared with the other ectoparasites [12]. The results obtained from a study conducted in Kermanshah (Iran) indicated that the most ectoparasites isolated from the rats were lice (77.7%) and the least of them (4.4%) were fleas [13]. In a similar study in Egypt, the louse *Polyplax spinulosa* was the most prevalent parasite isolated from rats [18]. Therefore, lice have been the most prevalent ectoparasite isolated from rats in most reports, which is consistent with the results of the current study. Linardi *et al.* (1984), in Brazil, argued that the level of infection of rats with mites had been two times higher than the level of infection with fleas and lice [19].

Volf (1991) maintains that there is a relation between the level of infection of rats with the louse *Polyplax spinulosa* and the age and gender [20]. However, in another study in Croatia, it was found that there is not any relation between the infection with ectoparasites and the age or gender at all [12]. A similar study on this field shows that as the age increases the level of infection with ectoparasites rises, which is consistent with the results of the current study. In the mentioned study, the level of infection of the males was significantly higher than that of the females [18]. But in the current study there was no difference in the level of infection in males and females. In the current study, clinical sings observed in the infected rats are consistent with that of the findings of other researchers [9, 17, 21, 22].

Volf and Grubhoffer reported in 1991 that the main immunogen of the louse *Polyplax spinulosa* is a glycoprotein component with an average molecular weight of 31 KDa which contains the oligosaccharide mannose [23]. Another review by Volf in 1994 indicated that the immunogen is found in the digestive tract of the louse and its semi-digested content, so scratching the rat's skin and bringing it into contact with the louse's feces might result in immunogenicity [24].

Infection with lice is more prevalent in cold seasons [8, 13, 25]. Therefore, providing health management is of more importance in these seasons. Effective control and health care is materialized through continuous and periodic monitoring to some extent and also anti-parasitic treatments [25-29]. At the suggestion of the Federation of European Laboratory Animal Science Associations (FELASA), parasitological tests should be performed at least 4 times a year and each time at least two samples of every groups of rats should undergo the tests in order to take the due measures to control infection if it is proven [27, 30-32].

REFERENCES

1. Aghayi, S., 1992. Ectoparasites in domestic animals. Exir pub, 2th, pp: 1-8.
2. Bossi, D.P., A.X. Linhares and H. Bergallo, 2002. Parasite arthropods of some wild rodents from Jureia – itatins ecological station, state of Sao Paulo, Brazil. Mem inst Oswaldocruz.rio de Janeiro, 97: 959-963.
3. Kim, K.C., 1985. Coevolution of parasitic arthropods and mammals. Wiley-interscience, New York; pp: 800.
4. Khachoian, V.I. and L.A. Arakelian, 1978. Case of the transmission of the rat trypanosome by lice. Parazitologiia, 12: 451-3.
5. Azad, A.F. and C.B. Beard, 1998. Rickettsial pathogens and their arthropod vectors, Emerg Infectious Disease, 4: 179-186.
6. Torres-Mejia, A.M. and J. Fuente, 2006. Risks associated with ectoparasite of wild mammals in the department of Quindío, Colombia. J. Appl. Res. Vet. Med., 4: 187-192.
7. Zoghi, A., 2006. Veterinary in public health service, Kamalolmolk Pub,1th, pp: 119-120.
8. Thomson, R.G. and B.C. Decker, 1988. Special veterinary pathology. Torento. Philadelphia, pp: 33.
9. John D. and W. Petri, 2006. Medical Parasitology. Markell & Voge's 9th ed St. Louis: Elsevier, Inc.; 2006.
10. Jones, T.C., R.D. Hunt and N.W. King, 1997. Veterinary pathology; 6th ed., Baltimore, William & Wilkins, pp: 669.

11. Soliman, S., A.J. Main, A.S. Marzouk and A.A. Montasser, 2001. Seasonal studies on commensal rats and their ectoparasites in a rural area of Egypt, the relationship of ectoparasites to the species, locality and relative abundance of the host. Parasitol., 87: 545-53.
12. Stojcevic, D., Z. Mihaljevic and A. Marinculic, 2000. Parasitological survey of rats in rural regions of Croatia. Vet. Med. Czech., 49: 70-74.
13. Telmadarraiy, Z., H. Vatandoost, S. Mohammadi, A.A. Akhavan, M.R. Abai, J. Rafinejad, *et al*., 2007. Determination of rodent ectoparasite fauna in Sarpole-Zahab district, Kermanshah province, Iranian J. Arthropod-Born Dis., 1: 58-62.
14. Carter, M.E. and D.O. Cordes, Leptospirosis and other infections of *Rattus rattus* and *Rattus norvegicus*. New Zeland Veterinary J., 28: 45-50.
15. Duden, L.A. and B.F. Page, 1991. Ectoparasites of commensal rodents in Sulawesi Utara, Indonesia, with notes on species of medical importance. Med. Vet. Entomol., 5: 1-7.
16. Kettle, D.S., 1995. Medical and veterinary entomology; 2nd ed., UK, CAB International, pp: 522-533.
17. Beaver, P.C., R.O.C. Jung and E.W. Cup, 1984. Crustacea, linguatulid, millipedes, centipedes, scorpions, spiders, ticks and mites. In: Beaver, P. C., Jung, R.O.C., Cup, E.W. (eds.), Clinical Parasitology. (9th ed.) Lea and Febiger. Philadelphia, USA., pp: 572-573.
18. Soliman, S., A.S. Marzouk, A.J. Main and A.A. Montasser, 2001. Effect of sex, size and age of commensal rat hosts on the infestation parameters of their ectoparasites in a rural area of Egypt. J. Parasitol., 87: 1308-16.
19. Linardi, P.M., J.R. Botelho, H.C. Cunha and N.S. Moreira, 1984. Ectoparasites of rodents of the urban region of Belo Horizonte, MG. I. Interaction between ectoparasites and Hosts., 79: 239-47.
20. Volf, P., 1991. *Polyplax spinulosa* infestation and antibody response in various strains of laboratory rats. Folia Parasitol (Praha), 38: 355-62.
21. Beck, W., 2004. Common endo- and ectoparasitic disease in small mammals – clinical feature, diagnosis and treatment. A review of the literature and own experiences. Tierärztl Prax, 32: 311-321.
22. Wall, R. and D. Shearer, 2001. The diagnosis and control of ectoparasitic infestation. Veterinary Ectoparasites-Biology, Pathology and Control. 2nd ed., Oxford, London, Edinburg: Blackwell, pp: 179-242.
23. Volf, P. and L. Grubhoffer, 1991. Isolation and characterization of an immunogen from the louse *Polyplax spinulosa*. Veterinary Parasitol., 38: 225-234.
24. Volf, P., 1994. Localization of the major immunogen and other glycoproteins of the louse Polyplax Spinulosa, 24: 1005-1010.
25. Sakom, M.A., 2005. Lab animals. Nour Pub,1th, 97-118
26. Soulsby, E.J.L. Helminths, 1982. Arthropods and Protozoa of Domesticated Animals. 7thed. Bailliere Tindall, London, UK.
27. Fisher, M.W. Beck and M.J. Hutchinson, 2007. Efficacy and safety of selamectin (stronghold®/revolution™) used off-label in Exotic pets. International J Appl. Res. Vet. Med., 5: 87-96.
28. Gönenç, B., H.O. Sarimehmetoğlu, A. Iça and E. Kozan, 2006. Efficacy of selamectin against mites (*Myobia musculi*, *Mycoptes musculinus* and *Radfordia ensifera*) and nematodes (*Aspiculuris tetraptera* and *Syphacia obvelata*) in mice. Laboratory Animals J., 40: 210-213.
29. Voipio, H., P. Baneux, I.A. Gomez, J. Hau and S. Wolfensohn, 2008. Guidelines for the veterinary care of laboratory animals, report of FELASA/ECLAM/SLAV joint working group on veterinary care. Laboratory animals J., 42: 1-11.
30. Homberger, F.R., R. Boot, R. Feinstein, A.K. Hansen and J.V. Logt, 1999. FELASA guidance paper for the accreditation of laboratory animal diagnostic laboratories. Laboratory animals J., 33: 19-38.
31. Kartman, L., 1947. Preliminary observation on the relation of nutrition to pediculosis of rats and chickens; 4th ed., Medwell Pub., pp: 867-868.
32. Tarshis, I.B., 1961. Laboratory and field studies with sorptive dusts for the control of arthropods affecting man and animal. Experimental Parasitol., 11: 10-33.