

Correlation between the occurrence of mites (*Demodex* spp.) and nematodes in house mice (*Mus musculus* Linnaeus, 1758) in the Gdańsk urban agglomeration

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Abstract: Co-infection of house mice (*Mus musculus* Linnaeus, 1758) with skin mites and helminths was studied. Intensity of their infection with skin mites (*Demodex arvicola* *musculi* Oudemans, 1897 and *D. flagellurus* Bukva, 1985) was found to be proportional to their infection with the nematode *Syphacia obvelata* (Rudolphi, 1802).

Key words: mites, *Demodex arvicola* *musculi*, *D. flagellurus*, *Myobia murismusculi*, nematode, *Syphacia obvelata*, co-infection, house mice, *Mus musculus*

INTRODUCTION

Species composition of mammalian parasitic fauna and the level of infection depend on numerous factors, e.g., parasite transmission pathways, host population density important for single-host parasites (particularly the host-specific ones), or the presence of all the necessary intermediate hosts, vital for parasites with life cycles involving numerous hosts. Doubtlessly, another important factor for the development of a parasitosis is the health status of the host and its individual immunity, frequently associated with synhospital occurrence of various parasites. Effects of host condition on the level of infection have been particularly strongly emphasised with respect to skin mites, particularly demodicids (Demodicidae, Acari, Prostigmata). They are stationary, obligatory parasites of mammals and show a high host specificity. They are most probably transmitted by direct contact with an infected individual within the host population. However, development of an infection (its intensity and prevalence) depends on the particular host and its condition. The role of reduced immunity, weakened resistance, metabolic disorders, diet, and hormones as factors facilitating skin colonisation by the mites and the appearance of skin pathologies has been frequently discussed (i.a. IZDEBSKA 2002). However, other parasitoses may prove to be

an important and usually overlooked factor worsening the host's condition (IZDEBSKA & ROLBIECKI 2004). In the present study, the problem of synhospital infection was analysed in synanthropic mammals represented by the house mouse (*Mus musculus* Linnaeus, 1758).

MATERIALS AND METHODS

In January 2005, 34 specimens (27 females and 7 males) of house mice (*Mus musculus*) from 2 sites (houses of flats) in the Gdańsk urban agglomeration were examined for the presence of parasites. Initially, to locate the hair-dwelling arthropods, the skin surface and hair were examined thoroughly under a wide-angle magnifying glass. To reveal the presence of skin mites, skin samples from several typical parts of the body (the head, i.e., around the eyes, cheek, chin, ear, and around the nostrils, as well as the neck, back, abdomen, fore and hind armpits, fore and hind legs, genital and anal areas) were subjected to the standard digestion procedure (IZDEBSKA 2000). The mites thus isolated were embedded in Faure's liquid.

To collect helminths, internal organs (lungs, heart, liver, gonads, stomach, intestines) were dissected and examined under a stereomicroscope. The parasites found were fixed in a 19:1 mixture of glacial acetic acid and formalin and preserved in 70% ethanol. Some helminths were mounted by clearing in lactophenol and embedding in glycerogelatine (ROLBIECKI 2002).

The level of infestation was determined on the basis of prevalence (percentage of infested hosts in the studied population), mean intensity (mean number of parasites per infested host), and range of intensity (the lowest and the highest number of parasites per infested host) (ZŁOTORZYCKA et al. 1998).

RESULTS AND DISCUSSION

The mice examined were found to host as few as 4 parasitic species: 3 mite species – *Demodex arvicola musculi* Oudemans, 1897, *D. flagellurus* Bukva, 1985, *Myobia murismusculi* (Schrank, 1781) – and the nematode *Syphacia obvelata* (Rudolphi, 1802). The mites were dominated by *D. arvicola musculi* (= *D. musculi* Hirst, 1917), found in 55.9% of the mice at a mean intensity of 9.2 specimens. Another frequent mite was *D. flagellurus* (8.8% and 7.7, respectively). The total demodecid prevalence and mean intensity amounted to 58.8% and 9.4, respectively. The 2 demodecid species were found to co-occur in 2 mice. *Demodex arvicola musculi* was present in the skin of the head, while *D. flagellurus* was located in skin samples from the genital-anal areas, which agrees with earlier observations (BUKVA 1985, IZDEBSKA 2000, 2004). Only 16 specimens of *Myobia murismusculi* were found in 3 mice.

Helminths were represented only by 102 females of the nematode *Syphacia obvelata* (including 62 ovigerous specimens) found in the colon and caecum. This nematode species is a cosmopolitan parasite, typical of laboratory and wild mice and rats (PRINCE 1950, ANDERSON 1992). So far, it has been recorded in Poland in the house mouse (i.a. ŁUKASIAK 1954), field mouse *Apodemus agrarius* (Pallas, 1771) (i.a. ŁUKASIAK 1954), yellow-necked mouse *Apodemus flavicollis* (Melchior, 1834) (i.a. SOŁTYS 1949), wood mouse *Apodemus sylvaticus* (Linnaeus, 1758) (i.a. FUR-

MAGA 1957), common vole *Microtus arvalis* (Pallas, 1776) (i.a. SOŁTYS 1949), pine vole *Pitymys subterraneus* De Sélys-Longchamps, 1836 (SOŁTYS 1949), bank vole *Clethrionomys glareolus* (Schreber, 1780) (i.a. KISIELEWSKA 1970), and muskrat *Ondatra zibethicus* (Linnaeus, 1776) (GRABDA 1954). The level of infection revealed in this study appears high: the prevalence and mean intensity amounted to 41.2% and 7.3 specimens, respectively, the intensity ranging from 1 to 23 specimens. Other authors reported the nematode from 11.5–53.6% of mice (ŁUKASIAK 1954, BLUSZCZ et al. 1987). The fact that the females only were found is not surprising: males of numerous *Syphacia* species die immediately after fertilisation and are usually difficult to find (RIZHIKOV et al. 1979). Although as many as 14 parasitic taxa (11 identified to species and 3 identified to genus) have been so far found in the house mouse in Poland, usually nematodes are dominants (POJMAŃSKA 1998).

The present study has revealed an interesting correlation between infection of mice with the skin mites *Demodex* spp. and the nematode (both with respect to prevalence and intensity). Of the 14 mice infected with *S. obvelata*, 13 (92%) were simultaneously hosting the demodecids: 11 mice were infected with *D. arvicolae* and 2 synhospitably with the 2 *Demodex* species. The demodecid infection intensity was found to increase in proportion to the increasing intensity of the nematode. The mean intensity of demodecid infection in the nematode-infected mice was 14.2 specimens, as opposed to the much lower (4.4 specimens) mean infection of the nematode-free mice. A similar correlation between infection with host species-specific *Demodex* spp. and helminths was reported from the brown rat *Rattus norvegicus* (Berkenhout, 1769) (IZDEBSKA & ROLBIECKI 2004).

CONCLUSIONS

The presence of some parasitic species seems to facilitate increased infection with others, which most probably affects the host's condition.

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