Parasites of *Mus musculus* Taken from an Inhabited Building in Terre Haute, Vigo County, Indiana

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Abstract

A total of 66 house mice, *Mus musculus*, taken in snap traps from an inhabited building in Terre Haute, Vigo County, Indiana, was examined for ectoparasites, and 64 of these were examined for endoparasites. Data were compared to similar data for feral house mice. Three species of ectoparasites, all mites, were found, *Ornithonyssus bacoti*, *Radfordia lemnina* (not previously reported on *Mus musculus*), and *Myobia musculi*. *Aspiculuris* sp., a nematode, was the only endoparasite found. As a group, there were significantly greater numbers of ectoparasites in male mice and significantly lesser numbers in middle-aged mice (10.0 to 14.9 grams). Female mice and younger mice harbored significantly greater numbers of endoparasites. There was no significant difference in the incidence of infestation of any group (age or sex) by endo- or ectoparasites. Feral house mice differed from those taken in an inhabited building by having: a greater diversity of endo- and ectoparasites; a much lower number of parasites per individual; a lower incidence of infestation; a greater number of endoparasites in male and older mice; and greater numbers of ectoparasites on older mice.

Introduction

While a graduate student at Indiana State University, the author shared one of several offices in an old, three story brick building on campus in which house mice, *Mus musculus*, were abundant. The present study was undertaken to determine the species, incidence, and the average intensities of infestation of the parasites in relation to the sex and age of the house mice and to compare these data with those obtained by Whitaker (1) for feral house mice.

Methods and Materials

Four rooms on each floor were sampled with a total of 78 snap-back traps baited with peanut butter. The traps were checked each morning between 22 March and 25 April, 1968, and mice were examined for external parasites immediately or frozen in sealed plastic bags for later examination. With the aid of a dissecting microscope, mites (the only ectoparasites found) were removed from the fur of the mice with dissecting needles. Mites were cleared and stained in Nesbitt's solution, mounted on slides in Hoyer's solution, and ringed with asphaltum. Dr. B. McDaniel at South Dakota State University confirmed the identification of *Radfordia lemnina*.

The stomach and intestines were examined for endoparasites using a dissecting microscope. Only nematodes, identified by Dr. Donald Norris of Tulane University as members of the family Oxyuridae, genus *Aspiculuris*, were found. These were washed in 0.85% saline and placed in a small vial containing an ethanol—glycerine mixture (200 ml

70% ethanol—50 ml glycerine) which had been heated almost to boiling. The alcohol was allowed to evaporate, leaving the parasites in glycerine.

Chi-square analysis was used to test for significant differences in the number of parasites found and the incidence of infestation in each age or sex class of the mice. The expected numbers were based on the percentage of mice in each class, *e.g.* if 20% of the mice fell in a class, then 20% of the parasites would be expected in that class if their distribution was by chance alone. One asterisk (*) after the chi-square value indicates significance at the 95% level, two indicate significance at the 99% level.

Results and Discussion

Three species of mites, *Ornithonyssus bacoti*, *Radfordia lemnina*, and *Myobia musculi*, were the only ectoparasites found. Taken as a group, average numbers per mouse and incidence of infestation were greater in mice from the building than in feral house mice (Table 1). The relatively close contact of mice in the building may facilitate infestation.

Ornithonyssus bacoti was the most abundant ectoparasite found in this study, with one mouse harboring 53 individuals, and 4 others harboring more than 20. House mice in this study showed greater average numbers per mouse and incidence of infestation of this parasite than did feral housemice (Table 1).

TABLE 1. *Comparison of ecto- and endoparasites of* Mus musculus *taken in an inhabited building with those of feral housemice (1).*

	Building			Feral		
Parasites	No. Parasites	No. Infested (%)	Ave. No. per mouse	No. Parasites	No. Infested (%)	Ave. No. per mouse
[1]Ectoparasites	321	47 (71.2)	4.86	456	132 (28.1)	0.98
Ornithonyssus bacoti	268	37 (56.1)	4.06	38	18 (3.9)	0.08
Radfordia lemnina	48	21 (31.8)	0.73	73	35 (7.5)	0.16
Myobia musculi	5	4 (6.1)	0.08	161	36 (7.7)	0.35
[2]Endoparasites	81	15 (23.4)	1.27	934	121 (24.8)	1.91
Heligmosomoides polygyrus	0	0	0.00	653	56 (11.5)	1.34
(*Aspiculuris* sp.)	81	15 (23.4)	1.27	0	0	0.00

[1] 66 mice examined from building; 470 feral housemice examined.
[2] 64 mice examined from building; 489 feral housemice examined.

Radfordia lemnina, the second most abundant ectoparasite found in this study has not previously been reported on *Mus musculus* (J. O. Whitaker, Jr., and Nixon Wilson, unpublished data). Re-examination of mites reported to be *R. affinis* from feral house mice (1) indicated that they were also *R. lemnina*. Again, average numbers per mouse and incidence of infestation were greater on mice from the building than on feral mice (Table 1).

Myobia musculi, the least abundant ectoparasite in this study, was found in greater average numbers per mouse and had a greater incidence of infestation in feral house mice (Table 1).

Aspiculuris sp., a nematode was the only endoparasite found in the 64 house mice examined, and all were in the intestine. This parasite was not found in the feral house mice which harbored *Heligmosomoides polygyrus*, another nematode, as the most abundant endoparasite (Table 1).

Feral house mice harbored a greater diversity of ecto- and endoparasites than did the mice taken in the building. More than 15 species of ectoparasites (included were categories for miscellaneous mites and larval ticks), and more than seven species of endoparasites (included were categories for ascarid larvae and cestodes) were found in the feral house mice; whereas, only three species of ectoparasites and one species of endoparasite were found in the mice from the building. A possible explanation is that feral house mice were taken in eight different habitats (weedy field, grassy field, soybeans, winter wheat, corn, sorghum, cut wheat, and cut corn) throughout the year; whereas, the mice in this study were taken in only one habitat and season. Habitat and season in which house mice are taken may influence the number and kinds of parasites found (1). Also, fewer mice were examined in this study.

The 66 house mice examined for ectoparasites (18 male and 48 female) were separated by sex and compared as to parasite load and incidence of infestation. There was a significantly greater number of ectoparasites as a group on male house mice (chi-square 57.27,** 1 df), but no significant difference between the sexes in incidence of infestation (chi-square 0.15,* 1 df) (Table 2).

Considered separately, *Ornithonyssus bacoti* (chi-square 41.16**, 1 df) and *Radfordia lemnina* (chi-square 17.47,** 1 df) both showed significantly greater numbers on male mice, but no significant differences were found with either species in incidence of infestation (chi-squares 0.11, 1 df and 2.62, 1 df, respectively) (Table 2). So few *Myobia musculi* were found that no comparisons were made (Table 2).

The 64 house mice examined for endoparasites were also separated by sex (17 male and 47 female) and compared as to parasite load and incidence of infestation (Table 2). There were significantly greater numbers of endoparasites (*Aspiculuris* sp.) in female mice (chi-square 6.98,** 1 df), but no significant difference in incidence of infestation (chi-square 0.34, 1 df).

TABLE 2. *Comparison of ecto- and endoparasites of male and female* Mus musculus *from the inhabited building.*

Parasite	Male			Female		
	No. Parasites	No. Infested (%)	Ave. No. per mouse	Parasites No.	No. Infested (%)	Ave. No. per mouse
[1] Ectoparasites	148	14 (77.8)	8.22	173	33 (68.8)	3.60
Ornithonyssus bacoti	120	11 (61.1)	6.67	148	26 (54.2)	3.08
Radfordia lemnina	26	9 (50.0)	1.44	22	12 (25.0)	0.46
Myobia musculi	2	2 (11.1)	0.11	3	2 (4.2)	0.06
[2] Endoparasites (*Aspiculuris* sp.)	11	3 (17.6)	0.65	70	12 (25.5)	1.49

[1] 18 males and 48 females examined.
[2] 17 males and 47 females examined.

Male feral house mice tended to have a greater number of ecto- and endoparasites than did females (1). Male house mice from the building had significantly more ectoparasites, but females had significantly more endoparasites. There was no significant difference between the sexes in incidence of infestation of endo- or ectoparasites in either study.

The house mice were divided into three groups (0.0 to 9.9 g; 10.0 to 14.9 g; and 15.0 or more g) approximately according to age as based on weight, and compared as to average numbers of parasites per mouse and incidence of infestation.

There were significantly greater numbers of ectoparasites in the older and younger mice when each was compared to the medium age group when the ectoparasites were taken as a group (chi-squares 22.83,** 1 df and 5.61,* 1 df, respectively) and when *Ornithonyssus bacoti* was considered separately (chi-squares 17.59,** 1 df and 6.16,* 1 df, respectively) (Table 3). There was no significant difference in incidence of infestation between the age groups when all ectoparasites were considered as a group (chi-square 0.26, 2 df) or when *Ornithonyssus bacoti* was considered separately (chi-square 0.77, 2 df).

Radfordia lemnina showed no significant differences between either the youngest and middle-age group (chi-square 0.45, 1 df) or the youngest and the oldest group (chi-square 1.90, 1 df), but there was a significant difference between the middle-age and oldest group (chi-square 6.33,* 1 df) (Table 3). If the two younger groups were combined, giving an average number of 0.54 parasites per mouse, there was a significantly greater number of parasites in the older group (chi-square 6.33,* 1 df). There was no significant difference in

TABLE 3. *Comparison of ecto- and endoparasites in different age groups (based on weight) of* Mus musculus *taken in an inhabited building.*

Parasite	0.0—9.9 g			10.0—14.9 g			15.0+ g		
	No. Parasites	No. Infested (%)	Ave. No. per mouse	No. Parasites	No. Infested (%)	Ave. No. per mouse	No. Parasites	No. Infested (%)	Ave. No. per mouse
[1] Ectoparasites	71	11 (84.6)	5.07	102	19 (65.5)	3.52	148	17 (73.9)	6.43
Ornithonyssus bacoti	62	10 (76.9)	4.77	85	15 (51.7)	2.93	121	12 (52.2)	5.26
Radfordia lemnina	9	5 (25.0)	0.64	14	7 (24.1)	0.48	25	9 (39.1)	1.09
Myobia musculi	0	0	0.00	3	2 (6.9)	0.10	2	2 (8.7)	0.09
[2] Endoparasites (*Aspiculuris* sp.)	21	5 (41.7)	1.62	51	7 (25.0)	1.82	9	3 (13.0)	0.39

[1] 14, 29, and 23 mice examined, respectively, in the age classes.
[2] 13, 28, and 23 mice examined, respectively, in the age classes.

the incidence of infestation between the age groups (chi-square 0.99, 2 df).

There was a significantly greater number of internal parasites in the middle-age and younger mice when each was compared to the oldest group (chi-squares 20.70,** 1 df and 13.36, ** 1 df, respectively), but no significant difference between the youngest and middle-age groups (chi-square 0.40, 1 df) (Table 3). There was no significant difference in incidence of infestation between the age groups (chi-square 2.42, 2 df).

Feral house mice tend to show an increase in the number of ecto- and endoparasites with increased age of the mouse. There were no significant differences in the incidence of infestation when all ectoparasites were considered as a group, but when considered separately, *Radfordia lemnina* showed a significant increase in incidence of infestation with increased age of the mouse (1).

Whitaker (1) reasoned that if animals were parasitized because of general, overall poor physical condition, then animals with ectoparasites should also be the ones with endoparasites. If, on the other hand, parasitism is only a chance happening, then the percent of the animals examined which one would expect to have both ecto- and endoparasites by chance can be computed as:

% with ectoparasites x % with endoparasites x no. animals examined for both = no. of animals with both endo- and ectoparasites by chance.

Whitaker (1) found that the relationship between endo- and ectoparasitism in feral house mice was due to chance. When the data in this study are treated in this manner, the same conclusion must be drawn for house mice from the building (0.734 x 0.234 x 64 = 10.68). The actual number having both endo- and ectoparasites was 11.

Literature Cited

1. WHITAKER, J. O., JR. 1970. Parasites of feral house mice, *Mus musculus*, in Vigo County, Indiana. Proc. Indiana Acad. Sci. 79:441-448.