First report of *Psorergates simplex* Tyrrell, 1883 (Acari: Psorergatidae) from wild House Mouse, *Mus musculus*, in the United States

EDWIN J. SPICKA
Department of Life Sciences
Indiana State University, Terre Haute, Indiana 47809

Abstract

Psorergates simplex Tyrrell, 1883, is reported from wild house mice, *Mus musculus*, in the United States for the first time. Two female mice from Pike County, Indiana, had 67 skin pouches containing numerous mites of all developmental stages and eggs. Pouches averaged 0.8 by 0.6 mm in size with one 0.2 mm opening. The ratio of male to female mites was 1 to 10. Female mites from ear scabs of one female mouse were slightly larger than those in the pouches.

Introduction

There are no records of *Psorergates simplex* Tyrrell, 1883 from wild house mice, *Mus musculus*, in the United States. Only two other reports of *P. simplex* in North America exist, Tyrrell's species description (12) and Flynn and Jaroslows' discussion of its nidification in the skin of laboratory mice (8). Unfortunately, the type specimen is unknown and Tyrrell's original description and figures are not adequate for species determinations. Taxonomic problems associated with *P. simplex* are discussed by Fain, et al. (7).

The purpose of this paper is to present information on *Psorergates simplex* found in skin pouches on wild house mice, *Mus musculus*, in Indiana. Pathogenic roles of psorergatid mites in the production of dermal lesions in vertebrates has long been known but most studies have been done in Europe.

Materials and Methods

Five house mice, *Mus musculus*, were snap-trapped in Pike County, Indiana, in June, 1974. Numerous skin pouches were observed on two females during routine examination for ectoparasites. Sebaceous material forced from pouches with micro-forceps was preserved in 70 percent ethonol, cleared and stained in a mixture of Nesbitt's fluid and acid fuchsin and mounted on microscope slides in Hoyer's solution. Microscopic analysis revealed numerous psorergatid mites in all stages from eggs to adults mixed with the sebaceous material. The mice were preserved in 10 percent formalin and then transferred to 70 percent ethanol for permanent storage.

All skin pouches of both female mice and 72 percent of the pouch openings were measured. The sebaceous material from all pouches was removed, cleared and stained. The contents of only 18 skin pouches were suitable for mounting, i.e., not completely dissociated. The total number of males, females, nymphs, larvae and embryonated and non-embryonated eggs was determined for each of the 18 pouches. The average total length of 20 specimens of each mite stage (except nymphs) and the average diameter of 20 of both kinds of eggs was

determined. Ear scabs and ear scrapings of one female were cleared, stained and mounted. A series of 20 female mites from that sample was measured for total length.

Results and Discussion

Out of 5 (2 male, 3 female) adult house mice, *Mus musculus*, 2 females possessed many skin pouches containing numerous mites, *Psorergates simplex*. One of the two females had thick scabs on its ears under which additional psorergatid mites were found. One male mouse had thin scabs on an ear and a pouch-like lump behind one ear but no mites were found in association with either the scabs or the lump. The presence of *Psorergates simplex* under scabs on the ear pinna and in skin pouches on the same individual is of interest. Tyrrell (12) described *P. simplex* from mice which harbored the parasite in "a crusty scab on the lower part of the back of the ear, extending round its outer edge and into the interior of the conch." No mention was made of skin pouches. On the other hand Flynn and Jaroslow (8) reported *P. simplex* occurring only in skin pouches of laboratory mice in Illinois. In two different areas in Belgium, Fain, et al. (7) found a species of psorergatid mite on *Mus musculus* in lesions on the ear (at Hamert) and in nodules on the body (at Nijmegen). Three species of psorergatid mites, *Psorergates cinereus*, *P. canadensis* and *P. watsoni* have been found in association with ear scabs of *Sorex cinereus*, *Microtus pennsylvanicus* and *Peromyscus maniculatus*, respectively, in Canada (9). *Psorergates glaucomys* was reported in a nodule by the ear of *Glaucomys volans* from Georgia (1). From the present study it is apparent *P. simplex* can occupy two different microhabitats on the same host.

Skin pouches occurred mainly on the face around the eyes (Fig. 1), on the lower part of the legs and in the perianal region of both females. A few pouches were scattered on the dorsum and sides of the mice. Skin pouches caused by psorergatid mites may be found on any part

FIGURE 1. *Photograph of female House Mouse,* Mus musculus, *with skin pouches (by eye) and scabs (on ear) induced by* Psorergates simplex.

of the body but they are usually concentrated around the eyes (2, 8), on the less hairy portion of the leg (5) or all over the body (6).

The two female mice had a total of 67 skin pouches which averaged 0.8 mm (range 0.4-1.6) long, 0.6 mm (range 0.3-1.2) wide, with an average opening diameter of 0.2 mm (range 0.1-0.4). The 18 skin pouches used in determining the total numbers of mites and eggs (Table 1) averaged 1.0 mm (range 0.7-1.5) long, 0.7 mm (range 0.4-1.1) wide, with an average opening diameter of 0.2 mm (range 0.1-0.4). Flynn and Jaroslow (8) reported pouches as large as 2 mm in diameter. Beresford-Jones (4) found psorergatid mites in cysts 0.5 to 1 mm in diameter. All the skin pouches of *Psorergates simplex* had an opening as described by Flynn and Jaroslow (8). The opening is probably the old site of a hair if the typical pouch is initiated by the entrance of one or more parasites into a hair follicle as proposed by Neuman (11) and believed by Flynn and Jaroslow (8). Beresford-Jones (3) reported only some psorergatid cysts with openings.

TABLE 1. *Average numbers of mites,* Psorergates simplex, *and eggs and average total lengths of the mites (except nymphs) and diameters of eggs in skin pouches on house mice,* Mus musculus, *in Indiana. Ranges are in parentheses.*

	Average Total Length (μ)	Average No. per Pouch
Females (from ears)	127 (113-140)	----
Females	115 (105-123)	31.2 (11-67)
Males	104 (88-110)	3.1 (0-10)
Nymphs[1]	----	13.1 (0-33)
Larvae	91 (75-113)	17.4 (3-56)
Embryonated eggs	78 (75-83)	16.6 (0-72)
Non-embryonated eggs	76 (75-78)	29.3 (1-112)

[1] Proto- and deutonymphs were not measured because it was difficult to tell them apart.

The average number of skin pouches on the two mice was 33.5. Beresford-Jones (4) found the usual number of psorergatid cysts was 1 to 8 although one mouse had 17 and another 22.

The average number of mites and eggs per pouch, average total lengths of mites and average diameters of eggs are given (Table 1). Female mites were most abundant and males least abundant. The ratio of males to females was 1 to 10. Beresford-Jones (4) reported 5 to 7 females to 1 male in his studies of psorergatid mites.

The female mites located under the ear scabs were slightly larger (Table 1) than those in pouches. It is possible that conditions under the scabs were not as confining as in skin pouches. The possibility of the mites on the ears being either a different species or subspecies than those in the pouches is being explored.

Only four other species of *Psorergates* are known from North America (9, 1). The latter authors and Lukoschus, et al. (10) list studies of psorergatid mites in Asia, Australia, Europe, Malaysia and South America. Fain, et al. (7) indicate it is preferable to consider *Psorer-*

gates simplex a species distinct from psorergatid mites on *Mus musculus* in Europe until *P. simplex* can be redescribed from specimens from the type locality. The redescription is underway (F. S. Lukoschus, pers. comm.). Whitaker (13) examined 470 house mice in Vigo County, Indiana, for ectoparasites and found none with psorergatid pouches.

Ectoparasites found on the five house mice were *Androlaelpas fahrenholzi* (1 individual found), *Myocoptes musculinus* (20), *Myobia musculi* (1), *Radfordia affinis* (1) and two immature myobiid mites. Those four species have been found on *Mus musculus* before (14).

Acknowledgements

I thank Dr. F. S. Lukoschus (Katholieke Universiteit, Nijmegen, The Netherlands) and Dr. A. Fain (Institut de Médecine Tropicale Prince Léopold, Antwerpen, Belgium) for aid in identification of the psorergatid mites. I am grateful to Dr. J. O. Whitaker, Jr. (Indiana State Univ., Terre Haute) for reviewing the manuscript and for assisting with identifications of the myobid mites.

Literature Cited

1. AH, H., J. C. PECKHAM, and W. T. ATYEO. 1973. *Psorergates glaucomys* sp. n. (Acari: Psorergatidae), a cystogenous mite from the southern flying squirrel (*Glaucomys v. volans*), with histopathologic notes on a mite-induced dermal cyst. J. Parasitol. 59:369-374.

2. BATEMAN, N. 1961. Simultaneous eradication of three ectoparasitic species from a colony of laboratory mice. Nature 191:721-722.

3. BERESFORD-JONES, W. P. 1965. Occurrence of the mite *Psorergates simplex* in mice. Austral. Vet. J. 41:289-290.

4. ————. 1967. Observations on the transmission of the mite *Psorergates simplex* Tyrrell 1883 in laboratory mice. In E. J. L. Soulsby (ed.). The reaction of the host to parasitism. Vet. Med. Rev. p. 277-280.

5. DE COCK, A. W. A. M., F. S. LUKOSCHUS, and A. P. ARIANI. 1970. *Psorergates etruscus* spec. nov. (Acari: Psorergatidae), a new itch mite from *Suneus etruscus* (Soricidae). Ann. Inst. Mus. Zool. Univ. Napoli. 19:1-9.

6. FAIN, A. 1965. Sur un cas de gale chez rat-taupe (*Cryptomys hottentus*) produite par un acarien du genre *Psorergates* (Psorergatidae: Trombidiformes). Acarologia 7:295-300.

7. ————, F. LUKOSCHUS, and P. HALLMANN. 1966. Le genre *Psorergates* chez les muridés description de trois espèces nouvelles (Psorergatidae: Trombidiformes). Acarologia 8:251-274.

8. FLYNN, R. J., and B. N. JAROSLOW. 1956. Nidification of a mite (*Psorergates simplex* Tyrrell, 1883: Myobiidae) in the skin of mice. J. Parasitol. 42:49-52.

9. KOK, N. J. J., F. S. LUKOSCHUS, and F. V. CLULOW. 1971. Three new itch mites from Canadian small mammals (Acarina: Psorergatidae). Can. J. Zool. 49:1239-1248.

10. LUKOSCHUS, F. S., J. M. W. LOUPPEN, and T. C. MAA. 1974. *Psorergates squamipes*, n. sp. (Acari: Psorergatidae), a skin mite from *Anourosorex squamipes* (Insectivora) in Taiwan. Pacific Insects 16:51-56.

11. NEUMAN, M. G. 1893. Sur un acarien (*Psorergates simplex* Tyrrell) de la souris. Bull. Soc. Hist. Nat. Toulouse 27:13-22.

12. TYRRELL, J. B. 1883. On the occurrence in Canada of two species of parasitic mites. Trans. Ottawa Field-Naturalists' Club p. 332-343.

13. WHITAKER, J. O., JR. 1970. Parasites of feral housemice, *Mus musculus*, in Vigo County, Indiana. Proc. Indiana Acad. Sci. for 1969, p. 441-448.

14. ———— and N. WILSON. 1974. Host and distribution lists of mites (Acari), parasitic and phoretic, in the hair of wild mammals of North America, North of Mexico. Amer. Midl. Natur. 91:1-67.