

Acaridae Incognito: The Case Of The Mighty Mite

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Mites, arthropods of 0.1 to 1.0 mm in length, are common ectoparasites of animals and humans. *Sarcoptes scabiei* is the most familiar of the blood-sucking parasitic mites infesting humans. A mite found in skin samples scraped from a patient's pruritic rash is commonly assumed to be *S. scabiei* with no further identification of species deemed necessary. Several parasitic mites from animal hosts and many species of free-living mites, however, can also infest households and cause symptoms in household members. Our report deals mainly with less familiar household mite infestations, particularly those due to the ubiquitous free-living mites. Because therapy varies greatly depending on which mite species is causing the infestation, the physician should make every effort to identify the mite accurately, which, as this case report shows, can be exceedingly difficult.

Case Report

A 22-month-old girl was seen by her family physician in Houston with a 3-week history of a pruritic rash. The girl continuously and energetically scratched the rash throughout the day. At night, the pruritus caused considerable distress and loss of sleep to her and to her parents. The rash had begun on the lateral lower legs, then had spread to the arms and entire body. It had worsened steadily despite the application of 1 percent hydrocortisone cream and 2 percent miconazole nitrate. Other family members had no symptoms.

On physical examination, patches of excoriated papules were densely scattered over the body, excluding the scalp, palms, and soles. The patient's mother had several papules associated with linear burrow-like lesions on the forearm. A scraping of the mother's lesion revealed what appeared to be a mite extremity. The diagnosis of

scabies was made. Crotamiton 10 percent cream was prescribed for the patient, with the usual instructions to wash clothes and linens. The mother, 38 weeks pregnant with the family's second child, received no medication.

Though initially improved, the rash did not completely resolve even after a second application of medication and topical steroids. Four weeks after the diagnosis, microscopic examination of a scraping of a papule on the patient's leg revealed a mite. This specimen was mistakenly discarded. Family members redoubled their efforts toward scabies control. The lactating mother joined the patient in crotamiton treatments, and the father, who had never had lesions, was prescribed lindane. The newly arrived 1-week-old infant was not treated. The parents washed bed linens and clothes in 140°F water daily. During a 2-week vacation the rash continued and began to involve the patient's scalp. The mother developed a pruritic rash, noted particularly one night after comforting the patient in the patient's bed. The patient developed wheezing.

Three months after the initial diagnosis, a dermatologist evaluated the family. Though unable to identify a mite in skin scrapings, his diagnosis was ectoparasite infestation, most likely caused by a mite, but not *S. scabiei*. He advised consultation with an entomologist. The parents painstakingly studied bedding and house dust specimens under a microscope and found a six-legged mite in its immature stages, which they mailed to a nearby university's department of entomology for identification. Unfortunately, the mite was damaged in transit and rendered unidentifiable.

To treat possible mite sources, the house was fumigated, the dog was treated with mange powder (5 percent N - [mercaptomethyl] phthalimide 5 - [0,0 dimethyl phosphorodithisate]), and all family members were treated with 10 percent precipitated sulfur. The father found a second mite through microscopic examination of vent dust, but again the mite was damaged in transit to the university. When the family left the house for 2 weeks, the child's rash gradually improved. Three weeks after their return, however, the pa-

Submitted, revised, 13 February 1992.

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tient again experienced pruritic skin lesions with nighttime awakening. A more extensive program of deinfestation was instituted, including professional fumigation every other week, weekly dog treatments, biweekly house sweeping, and treatment of the patient and her parents, initially with topical 1 percent permethrin then 0.5 percent malathion. The infant continued with sulfur treatment. Although the number of the patient's lesions decreased, new lesions appeared almost daily.

Microscopic screening of skin scrapings, house dust, and linen samples yielded a mite from the skin of the father (Figure 1). The specimen was hand delivered to an acarologist at a nearby university, where it was identified as a member of superfamily Astigmata, a grain mite. Subsequently, a mite taxonomist identified it as *Tyrophagus putrescentiae*. With the information known about the habitat of the grain mite, the family discarded area rugs, dog food, and dry goods from the family pantry. The pantry was fumigated. The family members' pruritus and rashes gradually resolved after an infestation that



Figure 1. *Tyrophagus putrescentiae* obtained from the father's skin (magnification $\times 500$).

had lasted 6 months, and there has been no recurrence in the last 20 months.

Discussion

If free-living mites encounter optimal household temperatures (26° to 27°C [78.8° to 80.6°F]) and relative humidities (75 to 90 percent),^{1,2} the typical density of approximately 11 mites per gram of household dust can increase to 3500 mites per gram of dust in heavy infestations.³ *Dermatophagoides* species, the most common of the 36 described species of dust mites,⁴ has been implicated as the major source of allergens in house dust.⁵⁻⁷ More recently, a second important class of antigenic dust mites, the grain storage mites, has been recognized.⁸⁻¹¹ Antigens released from disintegrating mite bodies elicit strong hypersensitivity reactions in some people,¹² while others in the same environment are almost completely unaffected. Sensitized individuals can experience allergic rhinitis, asthma, or dermatitis when the mites and their products come into contact with the skin or are aspirated along with house dust. Exposure to dust mites in young children has even been implicated in the children's subsequent development of asthma.¹³

The rash from a free-living mite is typically papular, vesiculopapular, or urticarial and can closely resemble that caused by scabies. While scabies lesions are typically found on the anterior axillary folds, periumbilical areas, elbows, and interdigital folds,¹⁴ the location of the rash of free-living mites follows no particular pattern. Another difference is the lack of burrows in the lesions of free-living mites. Ultimately, the diagnosis of the rash requires microscopic identification of the mite.

A dermatitis caused by mites can sometimes be confused with other ectoparasitic rashes.¹⁵ Bed bugs, fleas, and lice can also infest the home environment or inhabitants. Bed bugs are 3- to 5-mm, red-brown, wingless bloodsucking bugs whose bite is first noted on arising from sleep. Fleas can infest homes but unlike the mites are easy to see and typically attack the lower extremities, resulting in a linear or triangular group of three papules.¹⁶ Lice are also visible to the naked eye and are limited to the scalp or pubic hair. Occasionally, mosquito and spider bites are also mistaken for mite bites if the bite

is not witnessed; however, the distribution and course of these bites usually set them apart. Fungal skin infections, eczema, or asteatosis (winter itch caused by dry skin) can also mimic mite bites. With an intensely pruritic rash but no mites found on skin scrapings, the physician might even suspect neurotic excoriations or delusions of parasitosis.¹⁷

Because the mite can be difficult to find and even more difficult to identify, it is likely that many cases occur without being recognized. No formal study of the occurrence of rashes caused by mites exists, leaving the physician without a guide for knowing how frequently to suspect mites as a cause of pruritic rashes. When examining a person with a pruritic rash, the physician should especially consider mites if the pruritus is nocturnal, the course of the disease is protracted, and others in the family or workplace have similar symptoms. If a patient has had scabies diagnosed, but the rash does not respond to treatment, the physician should suspect either that *S. scabiei* is resistant to the drug treatment,¹⁴ that it has not been properly eradicated from the environment, or that another mite species is causing the rash. Once a nonscabies mite infestation is suspected, the next step is to find and identify the offending intruder.

Obtaining skin specimens for microscopic mite examination could seem futile, particularly when the physician suspects a free-living mite with "bite-and-run"¹⁷ habits. Free-living mites do not feed on blood but can become lodged in the skin¹⁸ as the inflammatory process progresses, allowing the diligent physician opportunity for capture.

Skin lesions are scraped for microscopic examination with a scalpel blade until blood is obtained. The blade is then dipped into a drop of mineral oil on a glass slide and is examined for adult or immature mites. If this procedure is unsuccessful, alternative methods of retrieval include applying clear tape to the skin and then attaching it to a glass slide for microscopic examination. Also, a punch biopsy, a sewing needle, topical tetracycline, or the burrow ink test could improve the yield.¹⁴ For transport and specific identification of captured mite specimens, a solution of 70 percent ethanol is recommended rather than the glass slide method, which failed so miserably in this case report.

Potential environmental sources for household mite infestations include birds' nests under attic

eaves or outside windows,¹⁹ rodents' nests in attics, dogs and dog beds,¹⁷ food storage areas, piled rotten leaves, and household dust. Because the list of sources encompasses the entire household and environs, the expertise of an urban entomologist or a county agent specializing in entomology can aid in pinpointing the source of the infestation. Fumigating an entire household before the identification of the mite and locating its source often proves futile, as shown in this case report. Not only is fumigation ineffective, but by reducing the mite population, it also makes further attempts at location and identification of the mite more difficult, resulting in a situation of Acaridae incognito.

A newly developed commercial kit (Acarex Test Kit, Fisons Pharmaceuticals, Rochester, NY) is available to assay for mite products (guanine) in the environment. Although this method does not aid in species identification, it does provide a useful method of documenting an infestation and quantitates the number of mites in various household samples.^{20,21} Additionally, post-treatment environmental assessment with the kit is a convenient and prompt indicator of the effectiveness of pesticide treatment. This assay, however, has not been used with skin scrapings.

The precise identification of the mite species relies on expert evaluation by an entomologist or mite taxonomist. Attempts at identification by the amateur can be confounded by the complex mite life cycle, which includes both six-legged (hexapod larvae) and eight-legged (octopod nymph) developmental stages, in addition to the subtleties of species differentiation in the adults. Once the mite and its source are identified, managing the patient and the household environment can be handled in a methodical way. The mainstay of therapy is the eradication of the mite by a series of fumigations and the removal of its food source. Household members can also benefit from topical medications, such as 1 percent lindane, 10 percent precipitated sulphur in petrolatum, or 10 percent crotamiton.

The mite causing the infestation in this case report, *T. putrescentiae*, is a food storage mite²² first identified from damp, rotten leaves by Schrank in 1776. *Tyrophagus* also has been found in house dust,¹¹ grain, dried fruit, mushrooms, apples, tobacco leaves, milk powder, stock feed, straw, and leather.²³

T. putrescentiae is an important agent in allergic respiratory diseases, particularly for farm and grain workers or for sensitized persons who live in damp homes.¹¹ Infestations have been associated with pruritic dermatitis,¹⁸ allergic rhinitis,²⁴ and asthma with spasmodic bronchitis, eosinophilia, and conjunctivitis.²³ In one study of 105 young adults, 43.1 percent were skin-test and specific-IgE reactive to *T. putrescentiae* antigens.⁸ Although multiple antigens have been found in storage mite extracts, they appear to be distinct from *Dermatophagoides* (dust mite) antigens.^{9,25} Thus, those sensitive to grain mites might not have demonstrated allergies to dust mites or other environmental components in the past. The patient in this case report had no history of asthma but experienced several months of intermittent wheezing during the mite infestation that resolved with resolution of the dermatitis.

In this case the mite source was presumed to be either the pantry food, the dog food, or area rugs, all habitats of *T. putrescentiae*. Several foods, particularly rice and unshelled pecans, yielded a weakly positive reaction with the mite assay kit several months after the foods were removed from the pantry, making these items the most likely hosts for the infestation. The intense dermal reactions in the 2-year-old patient suggests her hypersensitivity to mite allergens not shared by other family members who were in equally frequent contact with the pantry area. Ironically, the father, whose mild and sporadic symptoms were the least of anyone in the family, ultimately produced the mite whose identification set in motion the steps for the family's happy return to a normal lifestyle.

We are indebted to Francis Doepel, D.V.M., and Pete D. Teal, Ph.D., who assisted in the mite identification. Cal Welborne provided the final species identification.

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