

## *Cheyletiella blakei*, an Ectoparasite of Cats, as Cause of Cryptic Arthropod Infestations Affecting Humans

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*Cheyletiella blakei*, an ectoparasitic mite of domestic cats, can cause an extremely annoying, persistent and pruritic dermatosis of obscure origin (cryptic infestation) in susceptible persons having close contact with infested cats. Although the prevalence of cheyletiellosis in humans and cats appears to be low, evidence of its occurrence in California is increasing. Cheyletiellosis is often underdiagnosed in both its natural host and in humans. The small size of the mite, lack of publicity about the disease, frequent absence of symptoms in infested cats and failure to recover the mite from humans contribute to its delayed recognition. When *C blakei* or other mites are suspected of being the cause of a dermatosis, medical entomologists may help to hasten the diagnosis by examining the patient's physical surroundings, potential vertebrate hosts and other sources for the presence of mites. After *C blakei* has been eliminated from cats with an appropriate pesticide, the disease in humans is self-limiting.

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Several mites including *Cheyletiella blakei*,\* a widely distributed ectoparasite of domestic cats, are capable of causing cryptic infestations in humans.<sup>1-3</sup> This mite and the related *Cheyletiella yasguri* on dogs produce a skin condition referred to as cheyletiellosis. We refer to such infestations on humans caused by either species as human cheyletiellosis, on cats caused by *C blakei* as feline cheyletiellosis and on dogs caused by *C yasguri* as canine cheyletiellosis.

Typically, members of a household in which one or more infested cats live report persistent pruritic lesions (see below) but are unaware of their cause until *C blakei* is found weeks or months later. After this mite is eliminated from a cat, members of the household recover quickly without treatment—that is, the disease is self-limiting.<sup>4-8</sup>

Recovery of *C blakei* from cats (or *C yasguri* from dogs) is essential for establishing a diagnosis of human cheyletiellosis. To our knowledge there has been no published account in which a diagnosis of this disease was made on the basis of clinical evidence alone. Moreover, when a patient is unable to provide a clue as to the probable cause of the pruritus, and when veterinarians do not detect the mite on a cat, the complaint goes undiagnosed.

Among factors that tend to obscure the cause of feline cheyletiellosis is the small size of the mite, which ranges to as much as 500 microns in body length. Thus, the mites are scarcely visible to the naked eye and are easily overlooked.<sup>8,9</sup> Further, very few lay persons or medical practitioners seem to

be aware of its existence. The frequent lack of obvious symptoms in the natural host, the domestic cat, also contributes to the failure of patients to recognize the specific cause of their dermatitis. In our experience and that of others, dermatoses caused by *Cheyletiella* mites are commonly underdiagnosed in patients.<sup>4,10</sup>

The first published account of the occurrence of *C blakei* in California appeared in 1975.<sup>6</sup> In that infestation, a mother and her 5-year-old daughter were afflicted with the disease in Berkeley, Alameda County, in July 1974. Since then three additional infestations involving one to five persons have come to our attention. These include cases in Palo Cedro, Shasta County (April 1979), Petaluma, Sonoma County (August 1979), and Berkeley (March 1985). The Shasta and Sonoma County records are from the files of the California State Department of Health Services and were made available to us through the courtesy of Mr Gail Grodhaus.

The purpose of this communication is to alert the medical community to increasing evidence of *C blakei* occurrence in California, to present detailed case history information about the latest outbreak, to summarize some of the difficulties inherent in diagnosing human and feline cheyletiellosis and to call attention to methods used by medical entomologists in investigating cryptic arthropod infestations.

### Report of an Outbreak

The patient, aged 44 years, her husband and a daughter live in Berkeley, California. They purchased a 4-month-old white female Persian cat from a dealer in San Francisco in mid-December 1984. About four weeks later the mother began having pruritus that occurred daily during the late afternoon. In early February she traveled out of the country and

\**Cheyletiella parasitivorax* was originally the name applied to *Cheyletiella* mites found on rabbits, cats and dogs. Smiley (Proc Entomol Soc Wash 1965; 67:75-79) recognized *Cheyletiella* on cats as a distinct species and later likewise (Ann Entomol Soc Am 1970; 63:1056-1078) recognized *Cheyletiella* on dogs as distinct. *C parasitivorax* remains one of two *Cheyletiella* species occurring on rabbits.

her symptoms ceased but resumed on her return three weeks later.

Affected parts of her body included the breasts and anterior trunk down to the waist, the back and occasionally the arms and legs. The lesions were urticarial papules that typically occurred in clusters of three or four. According to the patient, they were first observed soon after the onset of pruritus and resembled mosquito bites. Rapid swelling and irritation occurred in some affected areas, though other areas did not react until the following day. She had difficulty breathing and experienced emotional distress. The lesions disappeared slowly over a period of weeks.

Her 7-year-old daughter was similarly, albeit less severely, affected. Her husband had a few lesions and reacted only slightly. Similar lesions developed in two children who were overnight guests, and the children reacted severely.

The mother consulted six physicians including three dermatologists, but was unsuccessful in obtaining a correct diagnosis. She had been treated with topical and systemic administration of steroids and had transitory relief. The patient strongly suspected that an unidentified arthropod was the cause of her pruritus and reported that on one occasion the pruritus had been more severe after her cat had shared her bed. Additionally, on more than one occasion, pruritus and papular formation began within about 30 minutes after she had held her cat. Scabies had been ruled out but flea bites and hives were still being considered in the differential diagnosis when a medical entomologist (R.S.L.) was contacted for assistance on March 21, 1985.

The asymptomatic cat had been treated with a bath of 0.06% pyrethrins and 0.6% piperonyl butoxide (Theradex) without apparent success. Two of us (R.S.L. and S.P.S.) subsequently examined the cat for *Cheyletiella* mites by first treating it with a pyrethroid wash, 0.05% tetramethrin (Aqua-Methrin), and then brushing it with a toothbrush along the spine and on both flanks anteriorly to the neck and posteriorly to the base of the tail. The brushing was examined in the laboratory (by R.S.L.) and 16 mites, identified as *C. blakei*, were found. The specific identification was confirmed by Professor Deane P. Furman, University of California, Berkeley.

The cat was treated three times at weekly intervals with 8% methylcarbamate (Sendran), but the owner of the cat still reported some pruritus, though it was reduced appreciably. Further treatment of the cat by M.R. Floyd, DVM, using 0.15% pyrethrins and 1.5% piperonyl butoxide (Para Pyrethrin Mist) finally ended the complaint.

Two other Persian cats at the pet shop, one of which had been treated earlier with a lime-sulfur dip, were examined by one of us (R.S.L.) for the presence of mites. None was recovered from the brushings obtained from these cats. The treated cat had been suspected of harboring mites because it had scabs across its head and along its back. Moreover, lesions developed on one of the wrists of an employee of the shop who had previously brushed the cats.

## Discussion

Human cheyletiellosis due to *C. blakei* is a prime example of a cryptic arthropod infestation whose resolution is commonly arrived at circuitously even when mites are suspected as the cause. Methods used to ascertain the cause of this acaridiasis have either failed or achieved success after varying periods of delay. Here we present what we believe to be a more efficient, direct approach to the investigation of suspected cheyletiellosis, preceded by a brief review of the epidemiology, diagnosis and treatment of the disease.

## Epidemiology and Diagnosis

Existing data suggest that *C. blakei* is probably cosmopolitan in distribution,<sup>11</sup> is host-specific on cats<sup>11</sup> and completes its entire life cycle on cat fur and skin.<sup>12</sup> Its life away from its host (on humans or in the environment) is transitory. The possibility that free-living *C. blakei* may occasionally cause dermatitis in susceptible persons cannot be discounted. Lesions may develop in casual visitors to a home having an infested cat without having direct contact with the cat either before the animal is treated or for a brief period afterward.<sup>12</sup> This possibility is suggested indirectly by a case involving *C. yasguri* in which a child had hundreds of pruritic lesions after it had slept on a quilt used by an infested dog<sup>13</sup> and, in another case, when the same mite was recovered from the floor, furniture and a mattress.<sup>14</sup>

There appears to be no authoritative explanation of how human skin lesions due to *C. blakei* are produced. In some instances, however, the distribution of skin lesions on the trunk and other body regions is noted to coincide with areas in contact with the infested cat. This observation suggests that the lesions are caused by bites of the mites.

Not surprisingly, once an etiologic agent is recognized, reports of its occurrence increase. Bjarke and co-workers<sup>8</sup> saw 37 cases of human cheyletiellosis in a two-year period. In California, canine and feline cheyletiellosis are being seen with increasing frequency.<sup>10</sup> The true incidence of the disease in humans and pets in this state (and elsewhere in the western United States) is not known, but it is probably not as uncommon as suggested by the dearth of reports from this region.

Patients usually are of little help in providing information on the probable source of their dermatitis. Bjarke and associates<sup>8</sup> in referring to human cheyletiellosis said that among 37 patients in 24 homes "only in two cases did the owners themselves suspect their dogs or cats as being the indirect cause of their itching dermatitis." Thus, patients would very likely seek the help of a physician first rather than a veterinarian.

If *C. blakei* is not suspected as the cause of dermatosis in humans by either a physician or a veterinarian,<sup>3,15</sup> cheyletiellosis may go undiagnosed or be attributed to delusions of parasitosis or to other causes. In the present case, scabies could have also been easily ruled out because the patient reported remission of her symptoms when she traveled abroad. Not infrequently, examination of lesions on the patients or their distribution on the body have led to suspicions or assertions that the complaints were due to some unspecified arthropod,<sup>5,6,15</sup> were due to hives<sup>7</sup> or were not caused by *Cheyletiella*.<sup>16</sup> In other cases, the dermatitis was mistakenly attributed to, or was suspected of being caused by, fleas on the pet.<sup>9,10,15</sup> Scraping the skin of a patient to obtain mite specimens is ineffective because the mites are not there for long, the unusual record of *C. blakei* recovery from skin notwithstanding.<sup>17</sup> Inexplicably, *Cheyletiella* species has also been obtained from shakings from underclothes belonging to a woman who had no known contact with pets.<sup>18</sup>

In humans, pruritic lesions caused by *C. blakei* are normally distributed on the anterior trunk, arms and legs—that is, often matching those parts of the body in contact with a cat when held.<sup>3,5,8</sup> In one case, the lesions occurred on the legs of a patient as a result of a cat having slept at the foot of the bed.<sup>1</sup>

Helpful information that could be obtained while interviewing patients suspected of having cheyletiellosis is whether remission of the dermatitis occurs when the patient is away from home<sup>17</sup> and whether the complaint began after the

cat was acquired<sup>3,9</sup> and subsequently became more severe after they handled it<sup>5,9</sup> or shared a bed with it.<sup>4</sup> Notably, not all persons in an infested household or in close contact with an infested cat are affected.<sup>5,17</sup>

While many infested cats are asymptomatic,<sup>11</sup> others have varying amounts of scale and may scratch themselves.<sup>4,5,11,19</sup> The cats we saw exhibited no gross lesions, visible flakings on the skin or fur or dandruff. The percentage of cats found to be infested with *C blakei* has varied in different studies, but reported infestation rates are typically low, such as 0.16% to 16.7%.<sup>20-22</sup>

The presence of *C blakei* has been established by the recovery of this mite in dust samples taken from the dust bag of a vacuum cleaner,<sup>6</sup> brushings<sup>3,6,9,12,15,23</sup> or combings<sup>5</sup> from fur, in cat feces<sup>24</sup> or in skin scrapings from cats.<sup>9</sup> These procedures are more likely to be undertaken if it is suspected that a cat is the source of the complaint or at least that an arthropod is the probable etiologic agent.

### Treatment

Cats have been successfully treated with a number of different pesticides including DDT,<sup>4,5,17</sup> derris,<sup>4</sup> malathion,<sup>19,23</sup> Mycodex with carbaryl,<sup>10,25</sup> ronnel,<sup>6</sup> lime-sulfur dip,<sup>10,25</sup> methylcarbamate<sup>9,24</sup> and pyrethrins.<sup>19</sup> Our experience in observing the effects of pesticide treatments is too limited to recommend any of them therapeutically except for 0.15% pyrethrins (synergized with 1.5% piperonyl butoxide) and ronnel, which yielded satisfactory results in the present study and in an earlier one,<sup>6</sup> respectively. Because cats are known to be adversely affected by certain pesticides,<sup>11</sup> treatment of a cat should ideally be made by or under the supervision of a veterinarian. Following elimination of *C blakei* from cats, the disease in humans is self-limiting.

### Detecting Mites on Cats

To determine the cause of canine scabies, flea or bedbug infestations and the like, as well as cryptic arthropod infestations affecting humans, medical entomologists rely mostly on investigative skills to recover the etiologic agents. These investigations usually involve examining the premises, suspected animal hosts and other potential sources of insects and mites. When the arthropod causing the complaint is found and identified, the corrective measure is often straightforward. Medical entomologists ordinarily contribute little, if any, authoritative clinical information useful for differential diagnosis.

When cats are suspected of harboring *C blakei*, we recommend that they be examined by placing them on a piece of white paper, treating them with a pesticide containing quick-knockdown components, such as pyrethrins synergized with piperonyl butoxide, brushing them and inspecting the brushings in 80% ethanol with a binocular microscope. Mites on paper are not readily apparent but when the brushings are placed in 80% alcohol, mites will float to the surface and are visible to the naked eye. This procedure was followed in each of the California cases mentioned above. In each case, the mites were found on the first brushing by the attending medical entomologist. Mites are commonly prepared for critical examination by clearing them in a suitable solution, such as Nesbitt's, and by mounting them in a medium such as Hoyer's in a slide preparation. Although mineral oil may be used as a temporary medium for slide preparation, it permits only gross examination of the mites. Attaching the mites to transparent,

cellulose adhesive tape risks damage to them when they are later removed to prepare them for scientific study. If they are to be sent to a medical entomologist (or acarologist) for examination, they should be preserved in 80% alcohol. Several mites should be sent to increase the likelihood of having both sexes available for diagnostic purposes and to detect the possible existence of multiple mite-species infestations.

Information that should accompany specimens are the locale, date of collection, vertebrate host and collector's name. A brief description of the complaint is also desirable. Accumulation of these kinds of data will eventually result in better understanding of the biology of this pestiferous mite.

If a physician, by a combination of clinical evidence and response to questions, is able to establish with reasonable certainty that the dermatitis is due to *C blakei*, then treatment of the cat with an appropriate pesticide is indicated. On the other hand, if an unknown arthropod is suspected as the cause of the dermatitis, then we recommend that the case be referred to a medical entomologist for follow-up investigation. In California and other western states, medical entomologists knowledgeable about parasitic mites may be contacted through some universities, university extension services or health departments.

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