

# What's Eating You? Cat Flea (*Ctenocephalides felis*) Revisited

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## PRACTICE POINTS

- Cat fleas classically cause pruritic grouped papulovesicles on the lower legs of pet owners.
- Affected patients require thorough education on flea eradication.
- Cat fleas can transmit endemic typhus, cat scratch disease, and bubonic plague.

Cat fleas (*Ctenocephalides felis*) often leave cats and dogs to bite humans, causing pruritic lesions of the lower extremities. Once flea bites are confirmed, various efforts can be made to eradicate these pests from the home or pets. Cat fleas also play a role in transmission of vector-borne diseases, especially endemic typhus.

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Fleas of the order Siphonaptera are insects that feed on the blood of a mammalian host. They have no wings but jump to near 150 times their body lengths to reach potential hosts.<sup>1</sup> An epidemiologic survey performed in 2016 demonstrated that 96% of fleas in the United States are cat fleas (*Ctenocephalides felis*).<sup>2</sup> The bites often present as pruritic, nonfollicular-based, excoriated papules; papular urticaria; or vesiculobullous lesions distributed across the lower legs. Antihistamines and topical steroids may be helpful for symptomatic relief, but flea eradication is key.

## Identification

*Ctenocephalides* fleas, including the common cat flea and the dog flea, have a characteristic pronotal comb that resembles a mane of hair (Figure 1) and genal comb that resembles a mustache. Compared to the dog flea (*Ctenocephalides canis*), cat fleas have a flatter head and fewer hair-bearing notches on the dorsal hind

tibia (the dog flea has 8 notches and the cat flea has 6 notches)(Figure 2).

## Flea Prevention and Eradication

Effective management of flea bites requires avoidance of infested areas and eradication of fleas from the home and pets. Home treatment should be performed by a qualified specialist and a veterinarian should treat the pet, but the dermatologist must be knowledgeable about treatment options. Flea pupae can lie dormant between floorboards for extended periods of time and hatch rapidly when new tenants enter a house or apartment. Insecticidal dusts and spray formulations frequently are used to treat infested homes. It also is important to reduce flea egg numbers by vacuuming carpets and areas where pets sleep.<sup>3</sup> Rodents often introduce fleas to households and pets, so eliminating them from the area may play an important role in flea control. Consulting with a veterinarian is important, as treatment directed at pets is critical to control flea populations. Oral agents, including fluralaner, afoxolaner, sarolaner, and spinosad, can reduce flea populations on animals by as much as 99.3% after 7 days.<sup>4,5</sup> Fast-acting pulicidal agents, such as the combination of dinotefuran and fipronil, demonstrate curative activity as soon as



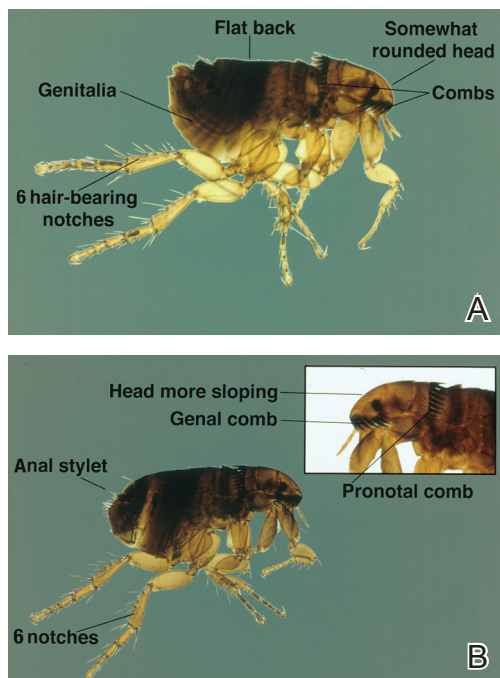
**FIGURE 1.** Characteristic pronotal and genal combs in a cat flea (*Ctenocephalides felis*).

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**FIGURE 2.** A, Male cat flea (*Ctenocephalides felis*). B, Female cat flea.

3 hours after treatment, which also may prevent reinfection for as long as 6 weeks after treatment.<sup>6</sup>

### Vector-Borne Disease

Fleas living on animals in close contact with humans, such as cats and dogs, can transmit zoonotic pathogens. Around 12,000 outpatients and 500 inpatients are diagnosed with cat scratch disease, a form of bartonellosis, annually. *Ctenocephalides felis* transmits *Bartonella henselae* from cat-to-cat and often cat-to-human through infected flea feces, causing a primary inoculation lesion and lymphadenitis. Of 3011 primary care providers surveyed from 2014 to 2015, 37.2% had treated at least 1 patient with cat scratch disease, yet knowledge gaps remain regarding the proper treatment and preventative measures for the disease.<sup>7</sup> Current recommendations for the treatment of lymphadenitis caused by *B henselae* include a 5-day course of oral azithromycin.<sup>8</sup> The preferred dosing regimen in adults is 500 mg on day 1 and 250 mg on days 2 through 5. Pediatric patients weighing less than 45.5 kg should receive 10 mg/kg on day 1 and 5 mg/kg on days 2 through 5.<sup>8</sup> Additionally, less than one-third of the primary care providers surveyed from 2014 to 2015 said they would discuss the importance of pet flea control with immunocompromised patients who own cats, despite evidence implicating fleas in disease transmission.<sup>7</sup> Pet-directed topical therapy with agents such as selamectin prescribed by a qualified veterinarian can prevent transmission of *B henselae* in cats exposed to fleas infected with the bacteria,<sup>9</sup> which supports the importance of patient education and flea control, especially in pets owned by immunocompromised patients. Patients who are immunocompromised

are at increased risk for persistent or disseminated bartonellosis, including endocarditis, in addition to cat scratch disease. Although arriving at a diagnosis may be difficult, one study found that bartonellosis in 13 renal transplant recipients was best diagnosed using both serology and polymerase chain reaction via DNA extraction of tissue specimens.<sup>10</sup> These findings may enhance diagnostic yield for similar patients when bartonellosis is suspected.

Flea-borne typhus is endemic to Texas and Southern California.<sup>11,12</sup> Evidence suggests that the pathogenic bacteria, *Rickettsia typhi* and *Rickettsia felis*, also commonly infect fleas in the Great Plains area.<sup>13</sup> Opossums carry *R felis*, and the fleas transmit murine or endemic typhus. A retrospective case series in Texas identified 11 cases of fatal flea-borne typhus from 1985 to 2015.<sup>11</sup> More than half of the patients reported contact with animals or fleas prior to the illness. Patients with typhus may present with fever, nausea, vomiting, rash (macular, maculopapular, papular, petechial, or morbilliform), respiratory or neurologic symptoms, thrombocytopenia, and elevated hepatic liver enzymes. Unfortunately, there often is a notable delay in initiation of treatment with the appropriate class of antibiotics—tetracyclines—and such delays can prove fatal.<sup>11</sup> The current recommendation for nonpregnant adults is oral doxycycline 100 mg twice daily continued 48 hours after the patient becomes afebrile or for 7 days, whichever therapy duration is longer.<sup>14</sup> Because of the consequences of delayed treatment, it is important for clinicians to consider a diagnosis of vector-borne illness in a febrile patient with other associated gastrointestinal, cutaneous, respiratory, or neurologic symptoms, especially if they have animal or flea exposures. Flea control and exposure awareness remains paramount in preventing and treating this illness.

*Yersinia pestis* causes the plague, an important re-emerging disease that causes infection through flea bites, inhalation, or ingestion.<sup>15</sup> From 2000 to 2009, 56 cases and 7 deaths in the United States—New Mexico, Arizona, Colorado, California, and Texas—and 21,725 cases and 1612 deaths worldwide were attributed to *Y pestis*. Most patients present with the bubonic form of the disease, with fever and an enlarging painful femoral or inguinal lymph node due to leg flea bites.<sup>16</sup> Other forms of disease, including septicemic and pneumonic plague, are less common but relevant, as one-third of cases in the United States present with septicemia.<sup>15,17,18</sup> Although molecular diagnosis and immunohistochemistry play important roles, the diagnosis of *Y pestis* infection often is still accomplished with culture. A 2012 survey of 392 strains from 17 countries demonstrated that *Y pestis* remained susceptible to the antibiotics currently used to treat the disease, including doxycycline, streptomycin, gentamicin, tetracycline, trimethoprim-sulfamethoxazole, and ciprofloxacin.<sup>19</sup>

Human infection with *Dipylidium caninum*, a dog tapeworm, has been reported after suspected accidental

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ingestion of cat fleas carrying the parasite.<sup>20</sup> Children, who may present with diarrhea or white worms in their feces, are more susceptible to the infection, perhaps due to accidental flea consumption while being licked by the pet.<sup>20,21</sup>

## Conclusion

Cat fleas may act as a pruritic nuisance for pet owners and even deliver deadly pathogens to immunocompromised patients. Providers can minimize their impact by educating patients on flea prevention and eradication as well as astutely recognizing and treating flea-borne diseases.

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