

Overview of Flea Allergy Dermatitis

▶▶ **Andrea Lam, DVM**

University of California Davis Veterinary Medical Teaching Hospital

▶▶ **Anthony Yu, DVM, MS, DACVD^a**

University of Guelph Ontario Veterinary College

Flea allergy dermatitis, or flea-bite hypersensitivity, is the most common small animal dermatologic condition.¹⁻³ In some regions of the world, it is the most commonly seen canine disease. This disease does not exist in locations that are inhospitable to fleas, such as those at elevations above 1500 ft or with low humidity (e.g., the desert).

Although there are more than 2000 documented species and subspecies of fleas, the cat flea (*Ctenocephalides felis felis*) is the species most frequently found infesting dogs, cats, and all caged pets in North America.

Flea Facts

The life cycle of the flea ranges from as few as 12 to as many as 190 days, with an average of 21 days. The time needed for development depends heavily on environmental conditions, particularly temperature and humidity. The optimal environment is a low-altitude geographic location, a temperature of 75°F (23.8°C), and a relative humidity of 78%.

An adult flea takes its first blood meal from a host within minutes of contact. Female fleas lay their first egg 24 to 36 hours after this blood meal. Flea eggs are smooth and slick. Only 30% of eggs remain on the haircoat; the remainder fall off the host into the environment. Hatching takes place within 1 to 10 days, again depending on humidity and temperature. A single female flea can lay 1000 eggs within 30 days, and most average 2000 eggs during their life.

Although eggs can hatch anywhere in the environment, development of the larvae that emerge from the eggs must take place off the host because mammalian body temperatures are too high for survival. Larvae are highly sensitive to heat and desiccation and therefore tend to move downward and away from direct light

sources. The larvae feed on adult flea feces (partially digested blood) in the environment. Within 5 to 11 days, a larva undergoes two separate molting stages before forming a pupa.

The pupal stage is the most resilient of all stages because the cocoon is highly resistant to desiccation. It also has a sticky surface that helps to prevent premature removal from the environment and that accumulates dust and other household particulates to provide protection. On average, the pupal stage lasts 8 to 9 days; however, fleas can pupate for up to 6 months if the environmental conditions are not ideal for emergence. Only with proper environmental stimuli, such as an increase in carbon dioxide, warmth, physical pressure, and vibration, will an adult flea emerge from its cocoon.

After emerging from the cocoon, adult fleas search for an appropriate host. Adult fleas are attracted to light and tend to migrate upward toward surfaces where contact with an appropriate host is more likely. Once a host is found, feeding and mating take place within 8 to 24 hours. Female fleas can consume 15 times their body weight in blood per day. Adult fleas act as obligate, permanent ectoparasites, preferring to remain on a host rather than in the environment.

Pathogenesis

Flea saliva contains histamine-like compounds, proteolytic enzymes, and anticoagulants. These proteins are released into the host during feeding and can act as inflammatory or antigenic stimuli in sensitive animals. Various immunologic responses are provoked, including immediate and delayed hypersensitivity reactions,⁴ late-phase IgE-mediated responses, and cutaneous basophil hypersensitivity reactions.⁵ Dogs with atopic dermatitis appear to be predisposed to the development of flea allergy dermatitis.^{6,7}

At a Glance

▶ **Flea Facts**

Page 220

▶ **Pathogenesis**

Page 220

▶ **Diagnosis**

Page 222

▶ **Treatment**

Page 223

▶ **Flea Control Products**

Page 224

^aDr. Yu discloses that he has received financial support from Greer Laboratories, Iams, Novartis Animal Health, and Pfizer Animal Health.



Dr. Yu (shown here with his dogs [from left to right] Timmy, Joey, and Bitsy) is associate professor of dermatology at The University of Guelph Ontario Veterinary College in Canada.

WEB
EXCLUSIVE



An extended version of
this article is available on
CompendiumVet.com.



FIGURE 1
Typical distribution pattern of flea allergy dermatitis affecting the caudodorsolumbar region and caudal thighs (caudal to the "waistline").



FIGURE 2
A fibropruritic nodule, a benign hyperplastic reaction to severe flea allergy dermatitis, on a dog.

QuickNotes

History and physical examination findings are the keys to making an appropriate diagnosis of flea allergy dermatitis.

Diagnosis

History and physical examination findings are the keys to making an appropriate diagnosis of flea allergy dermatitis. There is no breed or sex predilection, and flea allergy dermatitis can develop in animals of any age. Patients may exhibit seasonal or year-round pruritus, depending on their geographic location. The owner may report an increase in pruritus following the introduction of a new pet or a visit to a boarding or grooming facility.

Often, clinical signs manifest on the caudal aspect of the animal, especially in dogs (FIGURE 1). Evidence of self-induced alopecia; erythema; pyotraumatic dermatitis; dull, coarse

haircoat; hyperpigmentation; and/or lichenification may be observed affecting the dorsal lumbosacral region, tail base, caudomedial thighs, inguinal region, and umbilical fold.¹ Other physical examination findings include papules or encrusted papules, crusting, scaling, and, occasionally, fibropruritic nodules (FIGURE 2) in association with affected areas. Secondary superficial to deep pyodermas are common (FIGURE 3). Close examination of the skin and haircoat using a flea comb may reveal flea dirt or adult fleas (FIGURE 4). Some pets may even exhibit clinical anemia as a result of severe flea infestation (FIGURE 5). Pets that are fastidious groomers can ingest adult fleas



FIGURE 3
"Hot spot" or acute moist traumatic dermatitis. One of the common underlying etiologies of this condition is flea allergy or flea-bite hypersensitivity.

FIGURE 4
Flea comb. This is a useful tool to demonstrate fleas and flea dirt to clients who are in denial about the presence of fleas on their pet.

carrying the tapeworm *Dipylidium caninum* and may have segments of *D. caninum* in their feces.

Clinical manifestations of flea allergy dermatitis in cats can include miliary dermatitis, eosinophilic granulomas or plaques, or self-induced alopecia without active lesions (FIGURE 6). Affected areas may include the dorsum, inguinal region, caudomedial thighs, head, and neck.

A lack of fleas or flea dirt is commonly reported by owners and should not override a diagnosis of flea allergy dermatitis if clinical suspicion is high. Intradermal skin testing with flea allergen may reveal wheal formation with immediate and delayed hypersensitivity. Serum in vitro testing for flea-specific IgE has variable accuracy and does not identify animals with delayed hypersensitivity reactions. Histopathology is nonspecific and reveals a superficial perivascular inflammation, often containing eosinophils—a pattern that can be seen in other hypersensitivity reactions.

Treatment

Based on current knowledge of flea biology, topical or systemic flea adulticide therapy may be the only management required to establish adequate control over flea infestations. Many prescription flea control products are currently available (TABLE 1). Ideally, integrated pest management, including the use of flea adulticides along with insect growth regulators

(IGRs) or insect development inhibitors (IDIs), should be used as a long-term management program to effectively eradicate infestation while minimizing potential drug resistance. If the environment is heavily burdened with various stages of fleas, environmental control is also warranted. Vibrations from a vacuum cleaner help stimulate emergence of the adult flea from the impervious pupa and, hence, increase the likelihood of effective environmental ectoparasiticide control. One to two applications of a synthetic pyrethroid or fipronil as an environmental spray every 7 days should be sufficient, although the addition of a household IGR such as methoprene or pyriproxyfen and/or sodium polyborate in carpeted areas would produce the best results in the house. To avoid any potential adverse reactions, it is best to remove pets from the treated environment until the products have dried; therefore environmental treatment is often done in stages. Professionally licensed exterminators should be considered for yards and households that are heavily infested.

All blankets, bedding, and rugs that are favored by the affected pet should be laundered. All carpeted areas and furniture that can house preadult fleas should be vacuumed, and the vacuum bag should be disposed of immediately. All household pets should be prevented access to flea-dense areas, such as porches, garages, and crawl spaces. Contact

QuickNotes

A lack of fleas or flea dirt should not override a diagnosis of flea allergy dermatitis if clinical suspicion is high.

FIGURE 5

Severe flea infestation.



Fleas on a dog before treatment.



When the dog was bathed, the water turned red from the extreme amount of flea dirt in the haircoat.

TABLE 1

Flea Control Products Approved by the US Environmental Protection Agency and/or the US Food and Drug Administration^a

Product (Manufacturer)	Active Flea Control Ingredients ^b	Species and Minimum Age	Dosage/Administration	Mode of Action
Program/Sentinel (Novartis Animal Health)	▶ Lufenuron	▶ Dogs: 4 weeks ▶ Cats: 6 weeks	Monthly oral; also injectable q6mo feline product	▶ Inhibitor of chitin biosynthesis
Frontline Plus (Merial)	▶ Fipronil ▶ S-Methoprene	▶ Dogs: 8 weeks ▶ Cats: 8 weeks	Monthly spot-on	▶ Fipronil: GABA-gated chloride channel antagonist ▶ S-methoprene: Juvenile hormone analogue (IGR)
Advantage (Bayer Animal Health)	▶ Imidacloprid	▶ Dogs: 7 weeks ▶ Cats: 8 weeks	Monthly spot-on; can be used weekly	▶ Nicotinic acetylcholine-receptor antagonist
Advantage Multi (Bayer Animal Health)	▶ Imidacloprid	▶ Dogs: 7 weeks ▶ Cats: 9 weeks (do not use canine product on cats)	Monthly spot-on	▶ Nicotinic acetylcholine-receptor antagonist
K9 Advantix (Bayer Animal Health)	▶ Imidacloprid ▶ Permethrin	▶ Dogs: 7 weeks	Monthly spot-on	▶ Nicotinic acetylcholine-receptor antagonist ▶ Permethrin: Sodium channel modulator
Revolution (Pfizer Animal Health)	▶ Selamectin	▶ Dogs: 8 weeks ▶ Cats: 8 weeks	Monthly spot-on	▶ Chloride channel activator
ProMeris for dogs (Fort Dodge Animal Health)	▶ Metaflumizone	▶ Dogs: 8 weeks	Monthly spot-on	▶ Voltage-dependent sodium channel blocker
ProMeris for cats (Fort Dodge Animal Health)	▶ Metaflumizone	▶ Cats: 8 weeks	Monthly spot-on	▶ Voltage-dependent sodium channel blocker
Comfortis (Eli Lilly)	▶ Spinosad	▶ Dogs: 14 weeks	Monthly chewable tablet	▶ Nicotinic acetylcholine-receptor agonist (spinosyn)
Capstar (Novartis Animal Health)	▶ Nitenpyram	▶ Dogs: 4 weeks and 2+ lb ▶ Cats: 4 weeks and 2+ lb	One tablet prn or daily/EOD	▶ Nicotinic acetylcholine-receptor antagonist
Vectra 3D for Dogs ^c (Summit VetPharm)	▶ Dinotefuran ▶ Permethrin ▶ Pyriproxyfen	▶ Dogs: 7 weeks	Monthly spot-on	▶ Dinotefuran: Nicotinic acetylcholine-receptor antagonist ▶ Permethrin: Sodium channel modulator ▶ Pyriproxyfen: Juvenile hormone analogue (IGR)
Vectra for Cats & Kittens (Summit VetPharm)	▶ Dinotefuran ▶ Pyriproxyfen	▶ Cats: 8 weeks	Monthly spot-on	▶ Dinotefuran: Nicotinic acetylcholine-receptor antagonist ▶ Pyriproxyfen: Juvenile hormone analogue (IGR)

^aAdapted with permission from Mark Grossman and Carol Foil, Veterinary Information Network 2008. For the complete chart, visit www.vin.com/Link.plx?ID=37277. (EOD = every other day; prn = as needed)

^bIngredients active against other parasites not listed.

^cThis chart reflects the latest revision by VIN in September 2008. Please note that the following product has since become available: Vectra for Dogs and Puppies.

FIGURE 6

Common reaction patterns associated with underlying flea allergic dermatitis in cats.



Miliary dermatitis of the dorsum.



Self-induced alopecia of the ventral abdomen.

QuickNotes

Topical or systemic flea adulticide therapy may be the only management required to establish adequate control over flea infestations.

with feral cats, wildlife, and other unknown neighborhood animals should be prevented.

Eliminating all secondary bacterial and *Malassezia* infections provides short-term relief of pruritus. Shampoo therapy and short courses of oral corticosteroids are good adjunctive

therapies. Antihistamines and essential fatty acids are not effective in flea-allergic patients.

Finally, all animals in the household must be treated with ectoparasiticide therapy to prevent reestablishment of flea populations and perpetuation of disease. **C**

References

1. Scott DW, Miller WH, Griffin CE. Skin immune system and allergic skin disorders. In: Scott DW, Miller WH, Griffin CE, eds. *Muller and Kirk's Small Animal Dermatology*. 6th ed. Philadelphia: WB Saunders; 2001:543-666.
2. Cole LK. Fleas and flea allergy dermatitis. *6th Proc World Congr Vet Dermatol* 2008;119-125.
3. Dryden MW. Flea and tick control in the 21st century: challenges and opportunities. *Vet Dermatol* 2008;19(suppl 1):12.
4. Gross TL, Halliwell RE. Lesions of experimental flea bite hypersensitivity in the dog. *Vet Pathol* 1985;22:78-81.
5. Halliwell RE, Preston JF, Nesbitt JG. Aspects of the immunopathogenesis of flea allergy dermatitis in dogs. *Vet Immunol Immunopathol* 1987;17:483-494.
6. Kwocka KW. Fleas and related disease. *Vet Clin North Am Small Anim Pract* 1987;17:1235-1262.
7. Reedy LM, Miller WH. In: Reedy LM, Miller WH, eds. *Allergic Skin Diseases of Dogs and Cats*. Philadelphia: WB Saunders; 1989:171-187.

**APPLIED
DERMATOLOGY
WEB
EXCLUSIVE**



Otitis externa is another common, often frustrating, dermatologic condition. Visit **CompendiumVet.com** for one expert's approach to canine otitis externa, "A Practical Approach to Diagnosing and Managing Ear Disease in Dogs," by Paul Bloom, DVM, DACVD, DAVBP (Canine and Feline).