



FactSheet

Extension

Ohio State University Extension Fact Sheet

Entomology

1991 Kenny Road, Columbus, Ohio 43210-1000

Fleas

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Common Name	Scientific Name
Cat Flea	<i>Ctenocephalides felis</i> (Bouche)
Dog Flea	<i>Ctenocephalides canis</i> (Curtis)
Northern Rat Flea	<i>Nosopsyllus fasciatus</i> (Bosc)
Oriental Rat Flea	<i>Xenopsylla cheopis</i> (Rothschild)
Rabbit Flea	<i>Cediopsylla simplex</i> (Baker)

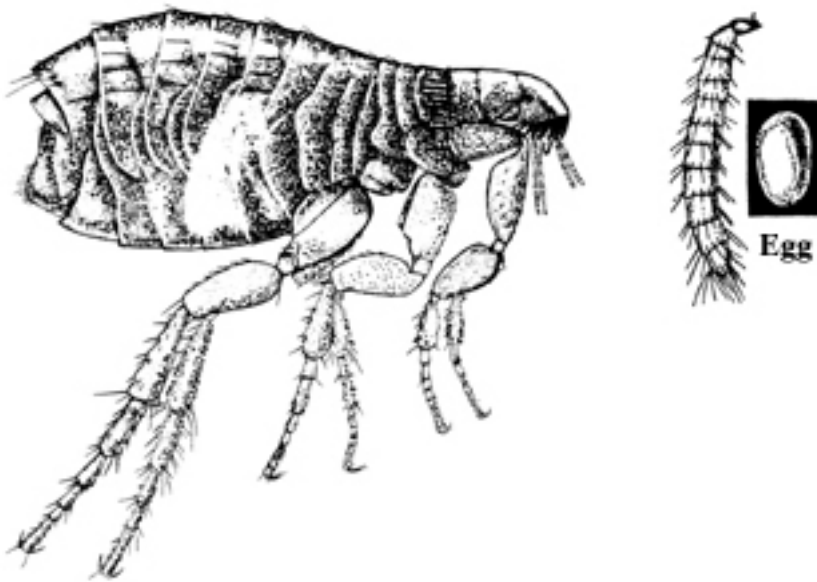
Fleas are very important pests in Ohio, especially during the months of July through October, but sometimes persist all year when indoors. It is estimated pet owners alone spend over \$1 billion each year controlling fleas.

Adult fleas are not only a nuisance to humans and their pets, but can cause medical problems including flea allergy dermatitis (FAD), tapeworms, secondary skin irritations and, in extreme cases, anemia. Although bites are rarely felt, it is the resulting irritation caused by the flea

salivary secretions that varies among individuals. Some may witness a severe reaction (general rash or inflammation) resulting in secondary infections caused by scratching the irritated skin area. Others may show no reaction or irritation acquired after repeated bites over several weeks or months. Most bites usually found on the ankles and legs may cause pain lasting a few minutes, hours or days depending on one's sensitivity. The typical reaction to the bite is the formation of a small, hard, red, slightly-raised (swollen) itching spot. There is a single puncture point in the center of each spot. (Ants and spiders leave two marks when they bite. Mosquitoes, bees, wasps and bedbugs cause a large swelling or welt). Also, fleas may transmit bubonic plague from rodent to rodent and from rodent to humans. Oriental rat fleas can transmit murine typhus (endemic typhus) fever among rats and from rats to humans. Tapeworms normally infest dogs and cats but may appear in children if parts of infested fleas are accidentally consumed.

Identification

Adult fleas are about 1/16 to 1/8-inch long, dark reddish-brown, wingless, hard-bodied (difficult to crush between fingers), have three pairs of legs (hind legs enlarged enabling jumping) and are flattened vertically or side to side (bluegill or sunfish-like) allowing easy movement between the hair, fur or feathers of the host. Fleas are excellent jumpers, leaping vertically up to seven inches and horizontally thirteen inches. (An equivalent hop for a human would be 250 feet vertically and 450 feet horizontally.) They have piercing-sucking mouthparts and spines on the body projecting backward. Also, there is a row of spines on the face known as a genal comb. Spine I (first outer spine) is shorter than Spine II (next inner spine) in dog fleas. Both spines are about the same length in the cat flea. The rabbit flea has a vertical genal comb with blunt spines. The genal comb is absent in both rat fleas. Eggs are smooth, oval and white. Larvae are 1/4-inch long, slender, straw-colored, brown headed, wormlike, bristly-haired creatures (13 body segments), that are legless, have chewing mouthparts, are active, and avoid light. Pupae are enclosed in silken cocoons covered with particles of debris.



Adult Cat Flea

**Larva and
Egg**

Life Cycle and Habits

Fleas pass through a complete life cycle consisting of egg, larva, pupa and adult. A typical flea population consists of 50 percent eggs, 35 percent larvae, 10 percent pupae and 5 percent adults. Completion of the life cycle from egg to adult varies from two weeks to eight months depending on the temperature, humidity, food, and species. Normally after a blood meal, the female flea lays about 15 to 20 eggs per day up to 600 in a lifetime usually on the host (dogs, cats, rats, rabbits, mice, squirrels, chipmunks, raccoons, opossums, foxes, chickens, humans, etc.). Eggs loosely laid in the hair coat, drop out most anywhere especially where the host rests, sleeps or nests (rugs, carpets, upholstered furniture, cat or dog boxes, kennels, sand boxes, etc.). Eggs hatch in two days to two weeks into larvae found indoors in floor cracks & crevices, along baseboards, under rug edges and in furniture or beds. Outdoor development occurs in sandy gravel soils (moist sand boxes, dirt crawlspace under the house, under shrubs, etc.) where the pet may rest or sleep. Sand and gravel are very suitable for larval development which is the reason fleas are erroneously called "sand fleas."

Larvae are blind, avoid light, pass through three larval instars and take a week to several months to develop. Their food consists of digested blood from adult flea feces, dead skin, hair, feathers, and other organic debris. (Larvae do not suck blood.) Pupa mature to adulthood within a silken cocoon woven by the larva to which pet hair, carpet fiber, dust, grass cuttings, and other debris adheres. In about five to fourteen days, adult fleas emerge or may remain resting in the cocoon until the detection of vibration (pet and people movement), pressure (host animal lying down on them), heat, noise, or carbon dioxide (meaning a potential blood source is near). Most fleas overwinter in the larval or pupal stage with survival and growth best during warm, moist winters and spring.

Adult fleas cannot survive or lay eggs without a blood meal, but may live from two months to one year without feeding. There is often a desperate need for flea control after a family has returned from a long vacation. The house has been empty with no cat or dog around for fleas to feed on. When the family and pets are gone, flea eggs hatch and larvae pupate. The adult fleas fully developed inside the pupal cocoon remains in a kind of "limbo" for a long time until a blood source is near. The family returning from vacation is immediately attacked by waiting hungry hordes of fleas. (In just 30 days, 10 female fleas under ideal conditions can multiply to over a quarter million different life stages.)

Newly emerged adult fleas live only about one week if a blood meal is not obtained. However, completely developed adult fleas can live for several months without eating, so long as they do not emerge from their puparia. Optimum temperatures for the flea's life cycle are 70°F to 85°F and optimum humidity is 70 percent. The cat flea is the most common flea in Ohio which feeds on a wide range of hosts.

Medication - Relief from itching can be obtained by applying carbolated vaseline, menthol, camphor, calamine lotion or ice. Highly sensitive persons should consult their physician for advise.

Repellents - Apply on the outer clothing and to exposed skin. Do not use under clothing. N,N-Diethyl-meta-toluamide (DEET) is very effective, but should not be used carelessly as severe allergies can develop. Do not apply repellents over cuts, wounds, irritated skin, around eyes or mouth or to the hands of young children.

Control Measures

Flea control is best achieved with a simultaneous, coordinated effort involving strict sanitation, pet treatment and premise treatment (both indoors & outdoors).

Inspection - Before treatment, discuss the pet's habits with family members to determine where resting and sleeping occurs most frequently. Flea activity "hot spots" can be detected by placing white socks over shoes and walking through the residence into suspected areas. Research has demonstrated that these areas will contain the highest amount of eggs, larvae and pupae even after vacuuming. Hot spots for homes with dogs are usually areas where the pet goes in and out of the house, eats, sleeps and spends time with the family at the base of furniture. For cats, check the tops of refrigerators, cabinets, book cases and higher locations.

One can monitor flea populations by placing a shallow pan of water with a little dish detergent (acts as a wetting agent which breaks water surface tension) on the floor. Position a gooseneck lamp with the light on about five to six inches above the liquid surface. Adult fleas will leap toward the light at night, fall into the detergent solution and drown. The Happy Jack and pulvex (Zema) flea trap is a commercial apparatus based on the same principle. Also, an

ultralight flea trap with a green light attracts fleas into a sticky tray.

Sanitation - Before vacuuming, collect all items (toys, shoes, clothes, etc.) off the floor, under beds, furniture, in closets, etc., to ensure best access for treatment. Also cover fish tanks, remove bird cages, pet food and water dishes and wash or dry clean any pet bedding. Vacuuming carpet with a beater-bar type vacuum where the pet rests and sleeps will help control flea larvae by removing eggs and dried blood feces (larval food) plus opening up the carpet's nap for more effective insecticide treatment. Vacuuming must be performed on a regular basis every other day to be effective. Flea larvae do not move far from the site of hatching when there is adequate food (dried blood feces from adults). Research indicates larvae spend 83 percent of the time deep in the carpet at the base of fibers frequently becoming entwined within the carpet. At pupation, the larva move up the carpet fiber spinning a camouflaging cocoon around itself. Vacuum especially where lint and pet hairs accumulate along baseboards, around carpet edges, on ventilators, around heat registers, in floor cracks, and under and in furniture where the pet sleeps.

After vacuuming, place the vacuum bag in a large plastic garbage bag and discard in an outdoor trash container. If the cleaner uses a liquid water medium in a plastic pan (rather than a dust bag) discard dirty water far away from the house.

Biological - Use an insect growth regulator (IGR), which is a hormone to prevent eggs from hatching and larvae from pupating into biting adults. The IGRs methoprene (Precor) and pyriproxyfen (Nylor, Archer) are odorless and nonstaining on carpets or fabrics. Methoprene usually will reduce flea populations up to 95 percent in just 14 days while pyriproxyfen, due to its photostability, lasts in carpets for many months controlling fleas. IGRs do not kill pupa or adults and are more effective when mixed with an adulticide. Ohio Pest Control operators report few homeowner callbacks when using a water-based spray mixture of methoprene (Precor) and propetamphos (Safrotin). Recent research shows the new IGR pyriproxyfen mixed with permethrin will often give 90 day control. IGRs are considered biodegradable and are not known to accumulate in the food chain. Methoprene, approved by the World Health Organization (WHO), is used in drinking water in some countries for mosquito larva control. IGRs are of negligible hazard to humans, pets, and the environment.

Parasitic nematodes, *Steinernema carpocapsae* (Biosafe, Exhibit, Vector TL) are labelled against flea larvae and pupae in the yard and garden habitats.

Botanicals - Pyrethrins, derived from the flowers of chrysanthemum, and rotenone from the roots of derris, cube and cracca plants, are good contact insecticides. Linalool (Demize), a citrus peel extract, is a natural, fast-acting flea killer, giving short residual control. Other botanicals include d-Limonene (Flea-Stop), citronella oil, eucalyptus oil, pennyroyal oil, balsam, lavender oil, calendula, comfrey, rosemary, tea tree oil and yucca.

Feeding pets garlic, brewer's yeast or B vitamins has not been shown to be effective against fleas. Also, pennyroyal, eucalyptus, rosemary, tea leaves and citronella have not provided effective control. In fact, overdosing of garlic or onion can be irritating or toxic to pets.

Prevention - Trim lawns and weeds to create a drier, less-ideal environment for flea larvae. Avoid piles of sand and gravel around the home for long periods of time. Fence yards to prevent dogs from roaming freely in heavily infested areas or contacting other infested animals. Discourage nesting or roosting of rodents and birds on or near the premises. Screen or seal vents, chimneys, crevices, etc. where rats, mice, squirrels, raccoons, chipmunks, etc. may use to enter crawlspaces and buildings. Wash or destroy pet bedding, regularly groom pets and vacuum frequently to remove up to 95 percent of the flea eggs, some larvae and adults. Only about 20 percent of the larvae might be removed when vacuuming since they wrap themselves around the bottom strands of carpeting.

Mechanical Control

An ultra flea comb, a product of Four Paws Product, Ltd. available through your licensed veterinarian, works well to remove fleas from the pet's haircoat.

Chemical Control

There are literally hundreds of products on the market for flea control on pets and the premises. For successful flea control, infested pets and the premises need to be treated at the same time.

Before application, read and follow the insecticide label and safety precautions. People and pets should be out of the house when treatments are made, and not return until the treated spray surfaces have dried. Depending on the carpet and type of treatment, it may take several hours (usually three to four hours to give the insecticide a better chance to work). To assist in drying, open windows and use a fan or air conditioner.

Usually, the licensed professional pest control operator has the experience, training, equipment and most effective insecticides for overall flea control.

Pets - There are many formulations as shampoos, aerosols, dips, sprays, dusts (powders), collars, dab-ons, spot-ons and monthly tablet or oral liquid treatments. Usually, the most effective pet treatments are available through licensed veterinarians.

Veterinary-Prescribed Products

1. Lufenuron (Program), a non-pesticide, is a product of Novartis Corporation that controls fleas on dogs and cats of any size, weight or breed. Program is safe for pregnant dogs and

puppies, and cats and kittens as young as six weeks. A dog is given one tablet once a month with a normal meal. Cats are given a tablet or a liquid dose once a month with a liquid meal. Lufenuron is a Chitin Synthesis Inhibitor (CSI) or Insect Development Inhibitor (IDI) that breaks the flea's life cycle by preventing eggs and larvae from developing. Nearly 100 percent of eggs laid by treated fleas do not develop. There is no effect on the adult flea. Tiny immature flea eggs, larvae and pupae may be hidden in carpets and upholstery or yard and dog houses, so it may take a few weeks to see how effective lufenuron works. Help by vacuuming your carpet and bathing your pet. Prevent fleas by giving lufenuron tablets once a month, year-round without interruption. Lufenuron is very safe to humans, pets and the environment. (Fleas have to bite pet.)

2. Fipronil (Frontline Top Spot), a pesticide, is a product of Rhone Merieux, Inc. that kills adult fleas up to three months on dogs and a month or more on cats. Ticks are killed for a month or more on dogs and cats. Frontline Top Spot can be used on 10-week old puppies, 12-week old kittens and pets receiving other medications. A pre-measured dosage in a plastic pipette is applied in a spot between the pet's shoulder blades. Be sure to part the fur and squeeze the tube to apply entire contents to the skin surface. For best results, do not bathe the pet two days before or after treatment. It remains effective after bathing or swimming. Fipronil dissolves in oils on the skin and, within 24 hours after application, spreads over the entire pet (translocation). Fipronil collects in the hair follicles and oil-producing glands of the skin where it slowly wicks out of the follicles covering the skin and fur for up to three months. Topline is also available for application in a metered spray pump. (Fleas do not have to bite pet.)

3. Cythioate (Proban), a pesticide, is a product of Bayer in the tablet or oral liquid formulation, that controls fleas on dogs of all ages (do not use in greyhounds or animals that are pregnant, sick, under stress, or recovering from surgery). It is not registered for cats. This organophosphate is rapidly absorbed from the gastrointestinal tract and distributed throughout the body. It causes the animal's blood to be lethal to the fleas that consume it. Fleas are killed (90 to 100 percent) by ingesting the drug from the body fluids during the first week. Additional treatments for several weeks are needed. (Fleas have to bite pet.)

4. Fenthion (Pro-Spot), a pesticide, is a product of Bayer, that controls fleas on dogs at the time of treatment and has good residual activity against many of the fleas that may reinfest the dog after treatment. Treatments should not be repeated more often than once every two weeks. Do not use with flea or tick collars. This topically applied organophosphate, with good systemic activity, is available in multiple sizes, each for a different weight range of dogs. Apply the applicator tube contents on the dog's back on the skin (part the hair) between the shoulder blades. Do not use on puppies under 10 weeks of age. Use with a control program reducing flea populations and flea breeding areas in the dog's environment - bedding, carpets, yard, etc. (Fleas have to bite pet.)

5. Imidacloprid (Advantage), a pesticide, is a product of Bayer, kills adult fleas on contact on cats and dogs before they can lay eggs and the flea life cycle is broken. About 98 to 100

percent of adult fleas are killed on the pet within 24 hours by a topical spot application on the back of the neck on cats and between the shoulder blades on dogs. A single dose works for at least four weeks on dogs and up to four weeks on cats. Imidacloprid (a pesticide) has been used on pregnant and lactating dogs and one-month-old puppies with no clinical abnormalities (Apply once a month). There is no waiting period to handle pets after application. Also, treated dogs immersed in water weekly for 30 days still experience nearly 90 percent flea control efficacy. (Fleas do not have to bite pet.)

6. Pyriproxyfen (Nylor, Archer), a non-pesticide, is a product of Virbac that is a new 3rd generation Insect Growth Regulator (IGR) - Juvenile hormone mimic. Pyriproxyfen (a non-pesticide) + permethrin (a pesticide)(Knockout) kills adult fleas and ticks plus kills flea eggs for dogs. Also Knockout* is formulated as a room and area fogger, killing adult and preadult fleas for seven months plus ticks, cockroaches and spiders.

If the homeowner treats the pet, powders or dusts are preferred over sprays. Put on rubber gloves and apply the dust thoroughly into the hair coat according to label directions. Cats are more susceptible than dogs to toxic effects of many insecticides since they groom themselves. Flea collars cannot always be relied upon to bring existing infestations under control. Collars do not kill existing premise infestations. Some animals are sensitive to collars. Watch for signs of dermatitis on the neck under the collar. Some labelled pet collar insecticides include pyrethrins, resmethrin, carbaryl (Sevin), diazinon, naled, tetrachlorvinphos (Rabon) + methoprene (Precor), d-limonene + linalool, rotenone, propoxur, and allethrin. Amitraz collars labeled for dogs only are effective on ticks. After 24 hours, 95 percent of attached ticks become detached.

Indoors - Automatic aerosol foggers, available in a canister, will give good knockdown and kill many biting adult fleas. Insecticides include methoprene + permethrin, pyriproxyfen + permethrin, resmethrin, allethrin, pyrethrins, tetramethrin, rotenone and propoxur (Baygon).

A coarse spray (40 psi) of diazinon (Knox Out 2 FM), propoxur (Baygon) and resmethrin (Vectrin) applied to cracks and crevices of floors, moldings and baseboards up to a height of one foot usually gives good results. Other flea killers include tetramethrin (Bio Flea Halt), amorphous silica gel (Drione, Tri-Die), bendiocarb (Ficam), diatomaceous earth (Answer, Organic Plus), esfenvalerate (Conquer), linalool (Demize) and d-limonene (Flea-Stop).

Additional highly effective insecticides available to the licensed commercial and pest control operator include bendiocarb + pyrethrins (Ficam Plus), cyfluthrin (Tempo), cypermethrin (Cynoff), deltamethrin (Delta Gard, Suspend), propetamphos (Catalyst, Safrotin) and tralomethrin (Saga). Water-based sprays are generally used for treating all carpeting and upholstered furniture.

Since there is no flea resistance to borates, many homeowners try switching to boric acid and

disodium octaborate tetrahydrate. Boric Acid (Fleabuster, Flea Halt) is a stomach poison killing fleas in the larva stage. Apply directly on vacuumed, cleaned carpets where pets frequently travel or sleep. Work powder deeply into fibers with a broom or rug rake. For upholstery, remove loose cushions, apply along creases and into corner, not to exposed fabric. Any powder visible after application must be brushed in cracks or removed. Borates are environmentally safe, odorless and used in homes with children and pets.

Outdoors - If the cat or dog regularly goes outside, treatment will be useful. Cats generally roam over greater areas than dogs and will pick up fleas seeding the home grounds with their infestations. Cats using sand boxes and dogs sleeping under shrubs and crawlspaces provide a reservoir of fleas. Treat outdoor areas frequented by pets during the summer months with fenvalerate, deltamethrin (Delta Gard), carbaryl (Sevin), propoxur (Baygon), diazinon (Knox Out 2 FM), pyrethrins, resmethrin, rotenone or bendiocarb (Ficam). Licensed commercial operators can use fluvalinate (Mavrik, Yardex). Animal pens, kennels, doghouses, crawlspaces and sandy soil or gravel driveways are important to spot treat with a hand sprayer. Clean and sweep porches, mow the grass and soak the dry soil with water before treating to bring the flea larvae up to the surface. Additional treatments at intervals, according to label directions, may be needed.

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