Fleas

Fleas are blood-sucking ectoparasites of humans and domestic animals all over the world. More than 2,200 species of fleas have been identified worldwide, but only about 30 species are found in Missouri. Humans are affected by few of these species. The most common species in Missouri is the cat flea, *Ctenocephalides felis* (Figure 1), but we also occasionally encounter the dog flea, *Ctenocephalides canis*; the human flea, *Pulex irritans*; and the oriental rat flea, *Xenopsylla cheopis*. An understanding of flea control is important because of their worldwide distribution, abundance, irritating bite and ability to transmit diseases.

Figure 1. The cat flea, **Ctenocephalides felis.**

Flea bites

The mouthparts of adult fleas are adapted for puncturing animal skin and sucking blood. Both male and female fleas suck blood. Fleas normally prefer the blood of pets over that of humans, so it is not unusual for people to coexist with their pet and its flea population under normal conditions and be bitten only occasionally. However, when the preferred host is absent, such as during vacation, a population of hungry adult fleas will accumulate. Hungry fleas will not discriminate between blood from pets and other animals and will attack almost any warm-blooded animal that comes near.

Cats and dogs scratch and bite themselves constantly when heavily infested. As a result, their skin is irritated and their coats become soiled and roughened. The initial irritation, itching and rash are caused by salivary secretions injected by the flea during feeding.

Human reactions to flea bites vary from person to person. A typical human reaction is a small, hard, red, itchy spot. Fleas are not attracted to some people, but other people are highly susceptible. Additionally, some people in flea-infested households may experience severe irritation from flea bites while others show no signs.

Fleas bite people most often on the legs and ankles. A small red spot with a light-colored center appears where the mouthparts entered the skin (Figure 2). Normally, flea bites do not swell, but some bleeding may occur, especially if the bite is scratched. A single puncture point caused by the mouthparts is generally apparent in the center of each spot. This characteristic distinguishes flea bites from the bites and stings of other arthropods. Spiders leave two marks when they bite, and the bites of mosquitoes, bees, wasps and bedbugs normally produce a large swelling or welt.

Life cycle

Four stages comprise the life cycle of fleas: egg, larva, pupa and adult.

Under normal conditions, the entire life cycle of cat fleas may be completed in as little as 20 to 35 days (Figure 3). The cycle is influenced by temperature and moisture conditions. Ideal conditions are 85 degrees F and 85 percent relative humidity. Under less favorable conditions, development takes longer and may require several months or even a year. Sustained temperatures below 55 degrees F inhibit development. Flea reproduction takes place indoors year-round, but outdoor reproduction is limited to warm-weather months.

Eggs

Flea eggs are smooth, ovular, whitish and about 1/50 inch long. The fertilized adult female flea lays two to 14 eggs after each blood meal and up to 800 eggs during her lifetime. The eggs are usually deposited onto the skin or hair of the host. These eggs drop off during a pet's normal activities onto bedding, carpet, rugs and mats. The greatest concentration of eggs is usually found where the pet spends the greatest amount of time.

Larva

Flea eggs hatch into larvae in two to 14 days, depending on environmental conditions. Newly hatched larvae are

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Figure 2. Fleas often target the legs and ankles when they bite humans.

about 1/16 inch long and will grow to a length of 1/4 inch. They grow by molting, or periodically shedding their skin. They pass through three molts and are fully developed in eight to 24 days. Larval growth can be prolonged to more than six months under adverse conditions. Flea larvae live in floor cracks, rugs, carpets and animal bedding. They are legless but move using bristles on their body. Larvae prefer dark, moist environments where they feed on a variety of organic debris, such as dry feces from adult fleas, pet feces and particles of pet food.

Pupa

Before entering the inactive pupal stage, a fully grown flea larva spins a silk cocoon. It incorporates debris particles into the cocoon as it is spun, which helps camouflage the cocoon with its surroundings. The larva pupates inside the cocoon, gradually darkening to a brownish color. It remains in the pupal state for five to seven days, but this stage can last for up to a year in unfavorable conditions.

Adult

Adult fleas are small, wingless insects about 1/12 to 1/8 inch long. They are dark reddish-brown to black. The hind pair of legs is modified for jumping, and an adult flea can jump up to 8 inches vertically and 16 inches horizontally. Their bodies are thin, laterally compressed and covered with stout, backward-facing spines, which allows them to move forward through the hair or feathers of the host and helps them resist being pulled out during grooming.

Adult fleas remain in the cocoon until they detect a suitable host. Depending on environmental conditions, an adult flea can remain in the cocoon for up to five months waiting for a host. From inside the cocoon, adult fleas recognize the presence of a potential host by sensing body heat, odor and air movement or vibration of floors and surroundings. Once an adult flea detects suitable stimuli, it exits the cocoon and seeks the host. This behavior is one reason flea infestations are often discovered by people returning home after vacation or moving into a new residence where hungry adult fleas have been waiting for an extended period of time inside a cocoon without access to hosts.

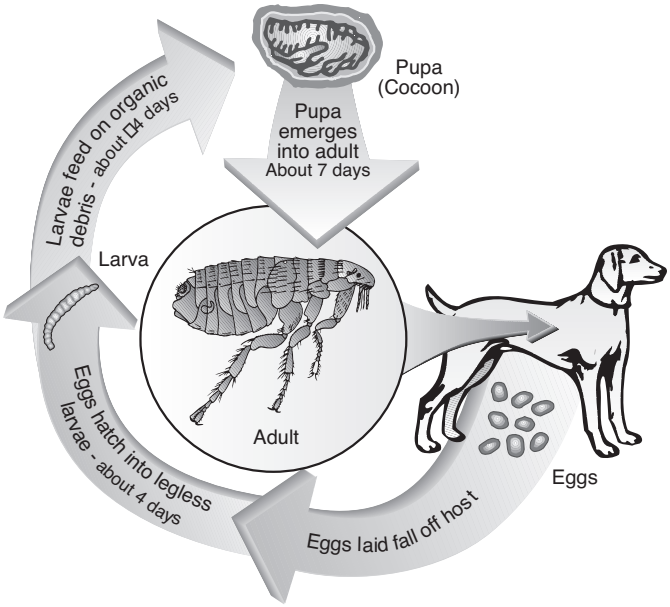

Figure 3. Typical flea life cycle (20 to 35 days).

Medical importance

Several pathogens may be transmitted by the bite of an adult flea. Plague and typhus continue to be a threat to human populations in the United States. Plague is found in some western states. Rodent populations serve as the reservoir for plague-causing organisms, and several flea species transfer the disease to humans. Typhus occasionally flares up in the southwestern and Gulf Coast states. The oriental rat flea (*Xenopsylla cheopis*) transmits typhus from rats to humans.

Many cats and dogs are infected with the tapeworm *Dipylidium caninum*. This tapeworm is transmitted when your pet ingests an adult flea infected with the larval tapeworm. Once inside the pet, the adult tapeworm develops and begins to produce eggs, which are shed in the pet's feces. Young children can get infected when they are in close contact with pets and inadvertently swallow an infected adult flea.

Rodents and pets are the most common sources of fleas and the diseases they carry. Flea feeding behavior and their lack of host specificity increase the potential for fleas to transmit disease-causing organisms between humans and their companion animals. An increased risk for flea bites and disease transmission from animals to humans exists in environments such as urban and rural interfaces, parks and natural areas.

Control

Flea control is a complex problem. This complexity is due to the multiple stages in the flea life cycle, and these stages being found on and off the pet both inside and outside the home. Flea control strategies have to account for all growth stages and all infestation sites. Treating for only one or two stages or locations almost always leads to reinfestation because any growth stage is capable of restarting the

infestation process. Despite these challenges, you can solve flea problems by first directing control strategies at flea stages on infested pets, then focusing on the places pets spend their time.

Pets

Because pets are the primary sources of flea infestations, address issues with pets and pet activities first. Whenever possible, establish a sleeping area for your pet that can be cleaned easily and regularly. Don't allow a pet in areas of the home where fleas are particularly annoying or where cleaning is difficult. Regularly wash all bedding, rugs and other items to which a pet has frequent access. When grooming a pet, use a flea comb, and bathe pets regularly. Soaps are effective at killing fleas, especially when left on for five to 10 minutes before rinsing. However, you only kill the fleas on the animal, so reinfestation is likely unless you also treat places where your pet spends time.

Veterinarians can provide flea control recommendations for your pet, and some of the best flea control products are available for purchase only from a veterinarian. These products are usually formulated to be absorbed into the bloodstream of the pet and kill adult fleas that take a blood meal. They may also contain an ingredient that disrupts the reproduction of female fleas or the growth and development of immature flea stages.

Approved over-the-counter insecticides can be purchased for direct application to your pet. Flea control products come in a variety of formulations — oils, dips, dusts, sprays and shampoos — and vary in cost and effectiveness. If you choose to treat your pet without the advice of a veterinarian, always use flea control products according to instructions on the label. Dust formulations are often more effective than sprays. When using dusts, put on rubber gloves, use a shaker, and rub the dust into the hair, being particularly thorough around the ears, between the legs and around the tail. Keep the dust out of the animal's eyes, nostrils and mouth. Flea collars are of some value in preventing an infestation from getting established but are of practically no value in eliminating an existing one.

Indoors

Because flea development occurs off of the host, pay attention to the areas in which pets are active. Flea eggs fall off of hosts as they move around their environment, and these eggs hatch into larvae that eventually develop into new adult fleas that reinfest your pet.

Vacuum the entire house — especially areas visited frequently by pets. Although vacuuming will not remove all fleas, eggs and larvae, you should vacuum weekly to remove as many fleas as possible. Areas that require special attention include pet resting areas, carpets, around legs of furniture that pets rub against, cracks and crevices along baseboards, upholstered furniture if the pets are allowed on such furniture, and under beds if the pets are allowed on them. After vacuuming, remove the vacuum bag, put it in a sealed plastic bag, and place it in the trash. If the vacuum bag is not removed, it can become a source of reinfestation.

If a flea infestation is minor, frequent and thorough, vacuuming might solve the problem. However, heavy infestations usually require application of an insecticide spray to carpeting, cracks and crevices, and other areas where fleas are present. Several over-the-counter insecticides are available for this purpose. Products containing pyrethrins or synergized pyrethroids (active ingredients usually have the suffix *–thrin*) are the most common. These products have been successful when used along with a product containing an insect growth regulator (active ingredients are methoprene or fenoxycarb). These products are odorless and nonstaining.

When using spray treatments, a second application is usually necessary 10 to 14 days after the first because eggs and pupae are more resistant and may not have been affected by the initial treatment. By the second application, eggs and pupae will have developed into larvae and adults, which are more susceptible to spray treatments.

A pest management company can apply spray treatments if you do not want to do it yourself. If you hire a pest management professional, obtain estimates from several companies and determine exactly what services you will receive. Normally, they will recommend a thorough cleaning of carpets, bedding and other affected areas before they apply a spray treatment. They will not treat animals, so you will still be responsible for fleas on your pets.

Total release aerosols, or bombs, containing pyrethrins or pyrethroids are available for killing adult fleas. Although effective on adult fleas, this type of application does not affect the other life stages, and reinfestation is likely unless treatment incorporates other strategies.

Warning on the use of chemicals

Apply chemicals only where needed or justified. Before using any chemical, read the label carefully for directions on application procedures, appropriate rate, first aid, storage and disposal. Make sure that the chemical is properly registered for use on the intended pest and follow all other label directions.

Keep insecticides in original containers, complete with labels, and keep them out of the reach of children and pets. Do not allow children or pets near treated areas before these areas dry. Carefully and properly dispose of unused portions of diluted sprays and empty insecticide containers.

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