Life Cycle

Eggs

- Eggs are pearly white, oval with rounded ends, and 0.5 mm in length.
- Eggs are deposited on the host and readily fall into the environment within a few hours.

Larvae

- Larvae are maggot-like, approximately 0.5 cm long, and covered with many small hairs.
- Larvae feed on blood in adult flea feces, organic debris, flea eggshells, and other flea larvae.
- Flea larvae will not develop outdoors in areas exposed to sunlight. Common sites of outdoor larval development are cool, shady areas where pets rest. Development occurs inside in undisturbed, protected sites (e.g., in carpets, under furniture, along baseboards).
- Speed of larval development to pupae is dependent on temperature and humidity.

Pupae

- Whitish pupae (cocoons 0.5 cm long) can be found in soil, on vegetation, in carpets, under furniture, and on animal bedding.
- Adult *C. felis* can begin emerging about 8 days after initiation of pupal development; all fleas are usually emerged by day 13 at 24˚C (75.2Ë□F) and 78% relative humidity.
- Adult *C. felis* may remain quiescent in the cocoon for up to 30 weeks at 11Ë□C (51.8Ë□F) and 75% relative humidity. Delayed emergence occurs when there are no appropriate environmental stimuli.
- Mechanical pressure, CO_2, and increased temperature stimulate flea emergence.

Adults

- Adults can emerge in as little as 13 days; emergence may be delayed up to 50 weeks depending on temperature and other stimuli.
- In temperate climates, 90 to 95% of fleas emerge within 21 to 35 days.
- In subtropical climates, 96 to 99% of fleas emerge within 14 to 28 days.
- Adults begin feeding immediately when on the host.
- Blood excreted by adult fleas dries into reddish-black pellets in the haircoat ("flea dirt" or "frass").
- Egg production begins within 20 to 24 hours of females taking their first blood meal.
- Female fleas can produce 40 to 50 eggs per day.

Overwintering and Recurrence in Temperate Climates

- *Ctenocephalides felis* survives for 10 days at 30˚C (37.4˚F) or 5 days at 10˚C (33.8˚F).
- In cold climates, fleas survive as adults on dogs and cats or wild mammals or within pupal casings as preemerged adults in protected environments.

Disease

- Annoyance and pruritus are common complaints.
- Heavy infestations may lead to iron deficiency anemia and death, particularly in young animals (dogs, cats, goats, cattle, and sheep).
- *Ctenocephalides felis* is capable of transmitting *Rickettsia typhi, Rickettsia felis, Bartonella hensalae, Dipylidium caninum,* and *Acanthocheilonema (Dipetalonema) reconditum*.
- Fleas can also transmit *hemoplasmas* (formerly *Hemobartonella* spp.; now known as *Mycoplasma*spp.), *Yersinia pestis* (plague), and *Francisella tularensis* (tularemia).
- Flea allergy dermatitis (FAD) is caused by hypersensitivity to antigenic material from the salivary glands of fleas.

Prevalence

- *Ctenocephalides felis* is the most common ectoparasite of dogs and cats in North America.
- *Ctenocephalides felis* is uncommon where relative humidity remains below 50% (desert southwest and Rocky Mountain states).

Host Associations and Transmission Between Hosts

- *Ctenocephalides felis* infests dogs and cats as well as many other mammalian and avian hosts.
- *Ctenocephalides canis* infests wild and domestic canids.
- *Echidnophaga gallinacea* infests poultry and occasionally cats, dogs, foxes, and various rodents in the southern United States.
- *Pulex simulans* infests rodents as well as cats, coyotes, dogs, foxes, opossums, raccoons, and other animals.
- *Pulex irritans* infests humans and also cats, dogs, foxes, pigs, and other animals.
- Adult *C. felis* uses visual and thermal cues to locate hosts. Newly emerged cat fleas survive only a few days before requiring a blood meal. In most homes, newly emerged fleas die within 1 to 2 weeks without a host.
- Acquiring newly emerged fleas from an infested environment is the primary cause of the initiation of an infestation. However, adult fleas can transfer directly from one host to another.

Environmental Factors

- Described previously under Life Cycle

Diagnosis

- Physical examination of the host is the first step in identifying fleas or flea feces within the hair coat. Flea feces can be removed with a flea comb and placed on a wet towel; the feces will dissolve and turn red

Treatment

- Comprehensive flea-control programs should eliminate fleas on pets, eliminate existing environmental infestations, and prevent subsequent re-infestation.
  - Moderate to severe infestations may take several months to bring under control.
- Elimination of fleas on pets can be achieved through use of available flea adulticides that are highly effective for killing adult fleas, including:
  - Dinotefuran: dogs and cats (monthly topical spot-on)
  - Fipronil: dogs and cats (monthly topical spot-on or spray)
  - Imidacloprid: dogs and cats (monthly topical spot-on or 8-month collar)
  - Indoxacarb: dogs and cats (monthly topical spot-on)
  - Nitenpyram: dogs and cats (daily or as-needed oral pill)
  - Selamectin: dogs and cats (monthly topical spot-on)
  - Spinosad: dogs and cats (Monthly oral pill)
  - Synthetic pyrethrins: dogs (various formulations including cyphenothrin, deltamethrin, flumethrin, and permethrin); some formulations are registered for use on cats (e.g. flumethrin) while others may be toxic to cats.
- Certain flea insecticide formulations contain insect groth regulators (IGRs) or insect development inhibitors (IDIs) either alone or in combination with adulticides. These agents, which include lufenuron, methoprene, and pyriproyfen, prevent flea eggs from hatching and kill larvae or early pupae.
- Occasionally, label-recommended application of topical insecticides will not appear to control the problem. This may be real or perceived, based on pet owner expectations of product performance, frequency of bathing, and reinfestation rates. If additional control measures are needed, products may be combined, environmental control may be implemented, or frequency of application may be increased if label allows. Federal law prohibits the extra-label use of pesticides regulated by the U.S. Environmental Protection Agency.

Control and Prevention

- Administer preventive flea and/or tick products as soon after birth as possible (consistent with label claims) for the life of the pet. However, because substantial geographic differences occur in flea prevalence and seasonality, prevention programs should be tailored to needs of the individual pet.

Public Health Considerations

- The common flea of dogs and cats, *C. felis*, transmits a number of zoonotic agents, including those that cause cat scratch disease (*B. henselae*), murine typhus (*R. typhi*), flea-borne typhus (*R. felis*), and tapeworms (*D. caninum*).Ingestion of infected fleas by children has resulted in development of adult *D. caninum* (tapeworm) in a large number of pediatric cases.
- Rodent fleas that may be acquired by dogs and cats in southern Rocky Mountain states and southwestern states may be vectors for bubonic plague (Yersinia pestis). These fleas may leave the host to bite humans.
- Flea infestation of homes and areas around a home often results in humans being bitten by newly emerging fleas, inciting an allergic response. The resulting papular rash can be mild to extensive, depending on numbers of fleas and individual hypersensitivity reactions.