

Class Insecta: Insects

Order Siphonaptera -- fleas

General

- 2-3mm long; wingless; laterally compressed
- adapted for jumping and clinging to host
- both sexes take blood meal
- Preferred temperature 18-27°C, 60-70% relative humidity

Life cycle and epidemiology

- Average life cycle = 14 - 28 days
- After taking a blood meal and mating on host, the females lay eggs on the host & eggs drop off into the environment.
- In most species, females mate only once, possibly 500 eggs/female/lifetime.
- Eggs hatch in 2 to 12 days
- The larvae feed on organic matter and undergo 2 molts and form pupae.
 - Flea Frass = digested host blood deposited by adults in environment for larvae food.
- The pupae emerge from puparium in 7 days to 1 year.
- The adult flea seeks a blood meal. Unfed fleas can survive for 2 months and fed fleas will live for a year.

Pathology

- Fleas are an annoyance to their host.
- Most damage is self-trauma (excoriations), due to pruritus.
- Can produce anemia and death in heavy infestation, especially puppies & kittens.
- Flea Allergy Dermatitis
 - Caused by the saliva of fleas (or even a single flea)
 - Intense pruritus (may lead to excoriations)
 - Papulocrustous lesions with inflammation and alopecia
 - Lower back
 - Tail head
 - Caudal & Inner thighs
- Flea-borne diseases:
 - Serve as intermediate hosts for *Dipylidium caninum* and *Dipetalonema reconditum*.
 - Serve as vectors for:
 - Plague (*Yersinia pestis*) by *Xenopsylla cheopsis*
 - Flea-borne (murine) typhus (*Rickettsia typhi*) by *Ctenocephalides felis*, *Xenopsylla cheopsis*, or wound contamination by flea feces
 - Cat scratch disease (CSD) (*Bartonella henselae*) by a scratch from a cat that has been infected by *Ctenocephalides felis*, or flea feces (poop; also called “flea dirt”) being inoculated through a cat scratch

Common species

- *Ctenocephalides felis* -- cat flea (most common flea on dogs and cats in NC)
- *Ctenocephalides canis* -- dog flea
- *Pulex irritans* -- human flea
- *Xenopsylla cheopsis* -- Oriental rat flea – vector for *Yersinia pestis*
- *Echidnophaga gallinacea* -- poultry or stick tight flea

Diagnosis

- Observe: fleas, flea dirt (frass)
 - On pet or in pet's frequent habitat (pet house, bed, blanket, etc.)
- Flea comb
- Wet paper towel test for flea dirt
- White socks test for environmental check

Treatment

- Remove pet from habitat until flea problem resolved
- Kill Fleas
 - on pet (topicals, sprays, systemics, etc.)
 - in habitat (sprays, foggers, vacuum, etc.)
 - Prevention of future infestation
- Itch Relief -- Corticosteroids
- If needed: Treat secondary bacterial infections & excoriations

Flea Control

- Integrated control program should include the host and the host's environment.
- On Host: 1) adult fleas
- Environment: 1) eggs; 2) larvae; 3) pupae; 4) adult fleas.
 - Majority (95%) of flea population is in the environment.
- Control: Clean up host's environment
 - Remove material that can serve as larval flea food
 - Remove host from flea-infested environment
 - Remove infested fomites (Pet beds, blankets, etc.)
 - Use chemicals to treat environment
 - Residuals or knockdown. Insect growth regulators
 - Control on host
 - (1) Dips, (2) Sprays, (3) Powders, (4) Shampoos, (5) Flea collars, (6) Systemics.
 - **Check for toxicity issues: Permethrins are highly toxic for cats. Avoid products with permethrins in combination dog/cat households where cats groom dogs. Treated dog should avoid close contact with cats for 24 hrs. post-application.**

Resistance

- Possible Flea resistance to insecticides
 - The use of organophosphates, carbamates and pyrethroids to control fleas generated resistance within a short period of time.
 - Lab strains of fleas show variable susceptibility to Imidacloprid and Fipronil.
- The main issue for failure maybe owner compliance, operator error. May not be true resistance.

Lice

Order Mallophaga – chewing lice

Morphology

- 1-3 mm long; flattened dorsoventrally; head is wider than the thorax.
- Wide head with chewing mouth parts
 - large mandibles to feed on fur, feathers, and epidermal debris.

Life Cycle / Epidemiology

- Eggs (nits) cemented to hair or feathers, hatch, series of nymphs, adults
- Transmitted by close contact or grooming tools or tack.
- More common in winter than summer due to crowded barn, longer coat, stressed host.

Pathology

- Chief effects are due to irritation / pruritus.
- Host bites or scratches infested areas causing fur, wool, feather, skin damage.
- Affected animals are restless, do not feed well.
- Egg and milk production will decline.
- Decreased feed conversion.
- Examples include *Trichodectes*, *Felicola*, *Bovicola* (*Damalinia*)

Treatment / Control

- Pets: shampoos, topicals, collars, etc.
- Livestock: sprays, dips, pour-ons, ear tags, back-rubs, dust bags, etc.
- **Insecticides do not kill the nits, thus two applications are required 14 days apart for optimal lice control.** The second application will kill newly hatched nymphs.

Order Anoplura - sucking lice

Morphology

- 1-6 mm long; flattened dorsoventrally; thorax is wider than head.
- Narrow head with piercing, blood-sucking mouth parts
 - Feed entirely on blood.

Life cycle and epidemiology

- Eggs (nits) cemented to hair, hatch, series of nymphs, adults
- Transmitted by close contact or grooming tools or tack.
- More common in winter than summer due to crowded barn, longer coat, stressed host.

Pathology

- Wool may be stained by lice feces & blood seeping.
- Heavy lice infestation may cause anemia and death.
- Examples include *Linognathus*, *Haematopinus*, *Solenopotes*.

Treatment / Control

- Pets: shampoos, topicals, collars, systemics, etc.
 - Livestock: sprays, dips, pour-ons, dust bags, ear tags, etc.
 - **Insecticides do not kill the nits, thus two applications are required 14 days apart for optimal lice control.** The second application will kill newly hatched nymphs.
 - **Due to being blood feeders, Anopluran lice can be treated with systemic drugs.** (ex. sc ivermectin 0.2mg/kg)
-