Siphonaptera - Fleas

- Laterally flattened
- eggs, larvae, pupae, adults
- Adults feed on blood, larvae feed on detritus including flea feces
Ctenocephalids - Dogs and Cats

- *C. canis* - dog flea
- *C. felis* - cat flea
- most fleas on dogs and cats in NC are *C. felis*
Ctenocephalides canis
**Ctenocephalides life cycle**

- Complex metamorphosis
- Temperature of 13-32°C (>35°C lethal to larvae and pupae)
- Relative humidity of 50-92%
- ~ 14-28 days (max of ~140 days)
- Eggs usually laid on host and fall to ground
- Unfed adults may survive ~ 2 months
Flea Life Cycle

- Eggs: 25-35 eggs/day
- Hatch in 2-5 days
- Larvae:
- Pupate in 7-14 days
- Pupae: delayed emergence up to 6 months
- Fleas emerge 1-4 weeks
- Fleas emerge 1-4 weeks
eggs

larvae

pupae

adults

10 - 15%

85 - 90%
• Adults rarely leave host - exception >200 fleas/individual
• May bite other hosts, e.g., man if dog/cat not available
• Diagnose by observing fleas, ‘flea dirt’, effects of bites
Fleas have a preference for living on the back, neck, and ventral (underside) regions of dogs and cats. It is unlikely to find fleas on the legs and tail. Where fleas live is influenced by host grooming habits.
Other fleas of importance

• *Pulex irritans* - human - may be picked up by dog - similar to *Xenopsylla* - lacks mesothorasic rod

• *Xenopsylla cheopis* Oriental rat flea - rodents - *Yersinia pestis* - plague - combs are absent and head is smoothly rounded

• *Echidnophaga gallinacea* - sticktight flea - birds, dogs, man - embeds in host, lack genal or pronotal combs, head is angular
Adult fleas hop on host and suck blood.

Adults emerge from pupae.

Females usually lay eggs in host's nest (Eggs that are laid in ulcers produced by attachment of the female flea to the skin, hatch. Larvae drop off.)

Pupae form inside cocoons.

Larvae spin cocoons.

Maggotlike larvae feed on organic material on ground.

Eggs in nest hatch.
Effects on host

• Blood loss - can produce anemia especially in young animals if infestation severe
• wound production
• allergy - flea bite dermatitis
• disease transmission - *Diplylidium caninum, Dipetalonema reconditium*
Flea bite allergy – dog/cat
Flea bite allergy

- More than 15 substances injected by fleas capable of eliciting an allergic response
- Diagnose with intradermal skin test
- Once allergic, always allergic
- A single flea is capable of eliciting a severe rx in allergic animal
- May include steroids – use for only short periods of time
- Eliminate fleas!!!!!!!
Flea Control

- LARVACIDES - insect growth regulators (IGR’s)
- lufenuron (Program) - Chitenase inhibitors
- Sentinel - lufenuron + milbemycin
- Precor - methoprene - juvenile hormone analog - spray or collar
- May take up to 3 months to achieve control with these products only
• ADULTACIDES
• Advantage - imidaclorprid (fleas only) - nicotinic receptor
• Frontline Top Spot - fipronil (fleas and ticks) - GABA regulated ion channels – reports of resistance currently undocumented by laboratory studies
• selemectin -REVOLUTION - fleas, heartworm, Otodectes
• Capstar (nitenpyran) – oral/daily/rapid kill
• Dozens of products, read label instructions carefully
• Natural products, e.g., citrus oil may be toxic for cats, liquid dishwashing soap, etc
Insecticide resistance

• *C. felis* isolates have been found to be resistant to DDT, dieldrin, malathion, chlorpyrifos, diazinon, propetamphos, bendiocarb, cyfluthrin, cypermethrin, fluvalinate, permethrin, pyrethrin, and carbaryl.

• Resistance to topical adultacides is currently being investigated
Other means of flea control

- Environmental modification - vacuum home
- Natural predators: Steinernema carpocapsae nematode
- Sanitation to remove eggs, larvae and food source
- Pesticide treatment of host and/or environment
How would one control *Ctenophalides* in the following situations?
• A completely indoor cat that has flea bite allergy.
• A group of dogs in an outside kennel.
• A household with a completely indoor cat (not allergic) and a dog that spends time both indoors and outdoors.
Lice

Anoplura - bloodsucking lice
Mallophaga - chewing lice

lice are dorso-ventrally flattened
Lice Groups

MALLOPHAGAN LICE
- Broad head to accommodate chewing mouth parts (mandibles & muscles).
- Feed on fur, feathers and epidermal debris.

ANOPLURAN LICE
- Narrow head w/ piercing / sucking mouth parts.
- Feed entirely on blood.
Lice

- Anoplurans - placental mammals only
- Mallophagans - mammals and birds
- Simple metamorphosis - young similar to adults
- Entire life cycle spent on host - very host specific
- Eggs (nits) attached to hair or feathers
- Pathology - irritation, blood loss, disease transmission
• Eggs are cemented to hair or feathers - ‘nits’
• hatch in approximately 8-18 days
• Go through a series of nymphal stages becoming adults in approximately 18 days - 3 weeks
• entire life cycle on same host - spread via close contact or fomites
Trichodectes canis

Transmission to Other Hosts via Direct Contact or Infested Grooming Tools

All Stages occur on the Host's Integument

Eggs (Nits) attached to Hair

Adults

Nymphs
Mallophagan (Chewing) Lice

Pathology

- Feed on fur, feathers, & epidermal debris
- Irritation
  - Restless, stressed animals
  - Bite / scratch => skin, fur, wool, feather damage
  - Decrease productivity
    - Egg and milk production decline.
    - Decreased Feed conversion.
Some important Mallophagans

- *Damalinia (Bovicola)* spp. - cattle, horses, sheep
- *Trichodectes canis* - dog (intermediate host for *Diplidium*)
- *Felicola subrostratus* - (only louse of cats)
- *Menopon gallinae* - poultry
Mallophagan
(Chewing) Lice

Ex. *Trichodectes, Felicola, Bovicola*
Anoplura - Bloodsucking lice

- Piercing mouth parts, head narrower than body
- Life cycle similar to Mallophaga
Pathology

- Staining of wool
- anemia
- Self mutilation
Anopluran (Sucking) Lice

Ex. Haematopinus, Lignonanthus, Solenopotes
Some important Anoplurans of domestic animals

- *Haematopinus eurysternus* (short-nosed cattle louse)
  
  *H. quadripertussus, H. tuberculatus* - cattle

- *H. asini* - horses, *H. suis* - pigs (only louse of pigs)

- *Linognathes vituli*, -long-nosed cattle louse (*L. setosus* - dog)

- *Solenoptes capillatus* - cattle
Figure 2. Haematopinus quadripertius: Nits (yellow arrow) and adults (white arrow) on the tail of a cow with intense infestation.
Diagnose/Treatment of Lice

- Observe lice, nits, soiling of coat with feces
- Usually a problem under crowded conditions, heavy winter coat - most often observed Winter and early Spring
- Irritation may lead to scratching/ hair or feather loss
- Insecticide sprays or dips for chewing or sucking – systemics for sucking lice only
- Treat twice at 7 to 14 day intervals if using sprays or dips
Other Anoplurans

- *Pthirus pubis* - man (dog)
- *Pediculus humanus capitis* - head louse of man

- *P. humanus humanus* - body louse of man
  - found in clothing - vector for *Rickettsia powazekii* (epidemic typhus)
Pediculus humanus humanus

- BODY LOUSE OF MAN
EGGS ARE DEPOSITED IN CLOTHING - NOT GLUED TO HAIR
Pediculus humanus capitis - Pthirus pubis