

# Arthropod Appendix

(Supplemental Material that will NOT be on Exams)

## LECTURE #10: Mites

Suborder Astigmata

Family Psoroptidae

*Psoroptes ovis* - scab on sheep, goats, cattle, horses reportable “disease” in cattle

*P. cuniculi* - Common in rabbit colonies used for research

*Chorioptes bovis* - scab mite of cattle and horses

Life cycle and epidemiology

- (a) Do not burrow like *Sarcoptes* but live at base of hairs, pierce skin, and cause inflammation  
- live under scab
- (b) Cause formation of thick heavy scabs rather than thickening of skin
- (c) Chorioptic mange is easily spread by contact with dislodged scabs or wool
- (e) Can see latent and subclinical cases - difficult to diagnose

### Other Astigmata

Occasionally pets and domestic livestock are infested with a few species of grain mites that are facultative feeders on mammals. Cats, dogs, horses, and cows are the animals most commonly affected. Situations that this is seen is when the animal comes into contact with infested grain, ie. cats and dogs hunting in and around infested grain or cattle and horses being fed infested grain or infested bedding being used. Often observe bites around face/muzzle.

Suborder Prostigmata

Family Cheyletidae

*Cheyletiella yasquri* - scurfy dandruff of young puppies, commonly in lab animals (rabbits)

*C. blakei* - on cats.

Both cause itching dermatitis on humans who handle these animals.

Associated with fleas - “phoresy”

Family Psorergatidae

*Psorergates ovis* - itch mite of sheep

*P. simplex* - skin injury in laboratory mice

Family Demodicidae

*Demodex folliculorum* in hair follicle of man

*D. brevis* in sebaceous glands of man

*D. bovis* - cattle follicular mite - hard nodules around the shoulders and auxillary region.

*D. phylloides* - hog follicular mite - pustules where skin thickened, such as on the snout, under the chest and abdomen.

*D. ovis & D. caprae* -- sheep and goats - nodules in the auxillary region and flanks

Family Trombiculidae

*Trombicula alfreddugesi* - North American Chiggers

*Neochongasta americana* - North American Turkey Chigger

Morphology --- 6-legged larvae

Life cycle and epidemiology

- (a) Larval stage is the only one feeding on vertebrates.
- (b) Normally attacks reptiles, birds and rabbits but will feed on man and domestic animals.
- (c) There is intensive pruritic reaction to injected saliva; immunity develops.
- (d) Horses and calves are affected on face and lips.
- (e) Dogs and cats will have red mites in their ears.

Mite Transmission of Pathogens

- 1. Fowl pox - demonstrated in bodies of mites 4 days after infective meal - no transmission.
- 2. Rickettsial pox - transmitted by house mouse mite.
- 3. Scrub typhus - transmitted by *A. trombicula* mite or chigger.
- 4. Q fever - transmitted by Gamasidae mites.
- 5. Fowl spirochetosis - transmitted by chicken mite.

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## LECTURE #11: Ticks

A. Superfamily Ixodoidea.

- 1. Family Argasidae - soft ticks - (multi host - multiple feeding ticks)

Morphology

- (a) Leathery body with no plates or scutum.
- (b) The gnathostome is ventral

Life cycle and epidemiology

- (a) Argasid ticks generally live and reproduce in nests or burrows of hosts.
- (b) Argasids feed repeatedly and periodically lay batches of eggs; common name, "tampun, blue bug, adobe tick".
- (c) Mate off host.

*Argas persicus* -- larvae attach and feed for 5 days. Then detach and molt to nymph. Feed and molt to second nymphal. Feed or molt to adult. Have long life - 12 years

*Otobius megnini* -- eggs deposited on ground and hatch in 18 to 23 days. The larvae crawl up vegetation to attach to animal. Move to ear canal. After molting in the ear, nymphs attach and remain as long as 121 days. Detach and drop to ground to molt to adults.

(Adults do not feed)

*Ornithodoros moubata* - relapsing fever, African Swine Fever.

*Ornithodoros porcinus*, *O. turicata* - African swine fever

- (a) African Swine Fever
  - transovarian and transtadial transmission
  - some vectors 12+ months without blood meal.

## LECTURE #12: Fleas & Lice

- I. Order Hemiptera - true bugs - most are phytophagous; all have piercing/sucking mouth parts; some are predators; a few are blood feeders

### *Cimex lectularis* - bed bug

1. Life cycle -- average will be 3 to 6 weeks
2. A bloodsucker that attacks man, pets and poultry at night feed on a 3 to 7 day interval.
3. Adults live off host and with no blood meal for up to one year.

### *Haematosiphon inodorus* - Mexican chicken bug occurs in south or southwest

*Triatoma spp.*, *Rhodnius spp.* - assassin bug attacks man, pets and poultry. Can serve as vectors of Chagas' disease,

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## LECTURE #13: Select Flies

Class Insect - the insects

Order Diptera - flies

Family Tabanidae

*Tabanus sp.* - horseflies - clear, heavy wings, large and robust.

*Chrysops sp.* - deerflies - brown band across the wings.

Morphology - large, robust flies.

Life cycle total time about 4 - 5 months

- (a) Eggs laid on vegetation or in soil near water, hatch in 5 to 7 days.
- (b) Larvae live around and in water for 2 - 3 months, can be up to a year or more.
- (c) Pupation occurs ashore.
- (d) Most species require blood meal before laying eggs.

Pathology

- (a) Only the females are bloodsuckers. Flies most active on hot sunny days.
- (b) Inflict a painful bite that continues to bleed after the fly has left. Saliva contains vasodilators and anticoagulants. See a bleeding wound.
- (c) Reduces growth and milk production by annoyance and blood loss.
- (d) Interrupted feeding and large blood meals facilitate disease transmission. **Mechanical transmitters** of anaplasmosis, anthrax, tularemia, hog cholera, equine infectious anemia and trypanosomiasis.

Family Ceratopogonidae - midges, punkies, "no-see-ums"

*Culicoides spp.* - females are bloodsuckers

Morphology

- (a) Very small, slender gnats, 0.5-2 mm
- (b) Will penetrate all but the finest mesh window screen. Potential problem even for confinement swine production.

Life cycle and epidemiology (total time: 2 - 6 weeks)

- (a) Larval and pupal stages are aquatic or semiaquatic.
- (b) Some live in rotting manure or rotting vegetation.
- (c) Some prefer soft or brackish water. Morning and evening feeders. Protect animals during this time.

Pathology

- (a) bites lead to dermal swelling, vesiculation and intense pruritis due to reaction to midge salivary secretion. "Queensland Itch" is a hypersensitivity to their bites in horses (withers, mane, ears, tail-head).
- (b) Vector for *Onchocerca cervicalis* in horses
- (c) Vector for blue tongue in sheep and white-tailed deer, epizootic hemorrhagic disease in white-tailed deer, and other arboviruses.

Family Simuliidae

*Simulium* - black fly

***Cnephia*** - southern buffalo gnat

Morphology

- (a) Small (1 to 4 mm) robust, humpbacked flies.
- (b) Short legs and broad wings.

Life cycle

- Eggs deposited on or near flowing water, hatch in 3 to 7 days; in N.C. active in February-March.
- The newly emerged larvae attach themselves by means of a caudal sucker and silken threads to submerge objects. Larval period 7 to 12 days.
- Pupation in a basketlike cocoon attached to shallow covered objects for 2 to 6 days.
- Can be problems in North Carolina on cattle and horses.

Pathology

- Adult female is bloodsucker with an irritating bite and toxic saliva.
- Flies occur seasonally in hordes that feed during daylight.
- May kill animals by blood loss and toxemia and plug bronchi when inhaled in great numbers.
- Transmits human onchocerciasis and Leucocytozoon in poultry.

Control

- Insecticides and Biological (Bti.)
- Bacillus thuringiensis israelensis* for mosquito and blackfly control
- Repellants and keep indoors

Family Psychodidae

***Phlebotomus sp.*** - sand flies (Old World)

***Lutzomyia sp.*** - gnats (New World)

Morphology

- (a) Minute, hairy flies resembling tiny moths.
- (b) Parallel wing veins with no cross veins except near base.

Life cycle and epidemiology

- Eggs, deposited in small batches in stables, poultry houses combining darkness, humidity and organic matter. Hatch in 6 to 17 days.
- Larvae feed on organic matter for 4 to 6 weeks.
- Pupae 10 days.
- Feed at night

Pathology

- (a) Transmit Leishmaniasis, Kala-azar, Bartonellosis, sand fly fever.

**Family Hippoboscidae *Melophagus***

***ovinus*** - sheep ked ***Lipoptena cervi*** -

deer ked ***Pseudolynchia canariensis*** -

pigeon fly

Morphology ---- Dorsoventrally flattened diptera; Have no wings and very small eyes and antenna.

Life cycle

- Females give birth to a larva that is fully developed and immediately pupates, attached to wool ("larvaposite").
- Transmission is by direct contact with peak population in cool weather. Similar to lice. Adult live 3 – 4 months, produce 10 -12 larvae total.

Pathology

- Bites are very irritating and cause scratching.
- Feces of insect stains wool.
- Heavily infested animals show emaciation, anemia and unthriftiness, especially lambs.

## Family Glossinidae

*Glossina sp.* - tsetse fly

Morphology ---- 6 – 14 mm long; Pronounced proboscis with palps held horizontally.

### Life cycle

- Female tsetse gives birth to fully grown larvae at intervals of 8 to 25 days, only one larva carried by female at a time. Larva feeds on flies uterine secretions by attachment to a “teat” in the uterus.
- Larva burrows into sandy soil and forms a puparium within an hour of larviposition.
- The adult fly emerges in 2 to 4 weeks.

Pathology - transmits African trypanosomiasis, or sleeping sickness, in humans and nagana in cattle. See *Trypanosoma sp.* from Dr. Levy’s section.

## Family Culicidae (mosquitos)

About 3000 species worldwide and 150 in North America.

*Culex sp., Anopheles sp., Aedes sp.*

Morphology - small, longlegged biting flies that have scales on wings.

### Life cycles

- Eggs layed in water (*Culex and Anopheles sp.*), mud, dried depressions or containers such as tree holes and old tires that are later flooded (*Aedes sp.*).
- Water is essential for larval and pupal stage development and as source of food (animal and plant dietrus).
- Larvae commonly known as wigglers and pupae as tumblers. Need to breathe air at water surface.
- Adult females are bloodsuckers.
- **Species differences in host and habitat preferences are very important to disease transmission potential.** Example: For Eastern Equine Encephalitis (EEE) the mosquito species that maintains intra-resevoir host infections (arborial habitat and bird feeders) may be different from transmitting or “bridging” species that feeds on mammals and birds when birds are numerous.

### Pathology

- Human disease: malaria, lymphatic filariasis, and many viruses including dengue, Japanese encephalitis, yellow fever.
- In other animals: eastern equine encephalitis, Venezuelan equine encephalitis, western equine encephalitis, avian pox, West Nile virus, *Dirofilaria immitis*.

# **END of Arthropod Appendix**

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