

Class Arachnida

Suborder Mesostigmata: Mites

Ornithonyssus sylviarum - Northern fowl mite

General

- Most important ectoparasite of layers, breeding, and backyard flocks in the USA

Life Cycle & Ecology

- Its entire life cycle is spent on the host.
- **Mites tend to congregate near the vent area**, but also on breast & back during heavy infestations.
- Mite eggs are laid in masses at the base of the feathers. Larvae, nymphs, adults live on the bird.
 - Can complete life cycle in 5–7 days., thus rapid increase in population
- It may survive for 2 to 3 weeks in absence of avian host.
 - So depopulate a chicken house for more than 3 weeks.
- Bird to bird transmission by contact with infested birds, infested equipment, or by mite dispersion.
- Spread from farm to farm by sparrows, pigeons, rodents, egg flats, bird crates, people, etc.
- Common on wild birds and rodents, which readily introduce it into commercial poultry facilities unless sound biosecurity practices are in place.
- In the absence of birds, the mite will attack humans, domestic livestock, and pets.
 - But fertile populations are reported only on birds.

Pathology & Diagnosis

- Northern fowl mites are obligate bloodsucking parasites, may cause severe anemia (pale pink comb) and even death.
- Cause loss of weight, decreased egg production, decreased feed conversion, anemia, and death.
- Also, an irritation that causes stress, restlessness, and fighting.
- DZ transmission (maybe) - Viruses have been isolated from these mites, but are not significant vectors (Western equine encephalomyelitis, St. Louis encephalitis, Newcastle & fowlpox).
- Mites are typically found by parting feathers in the vent area, which may have thick, crusty skin, severe scabbing, and soiled feathers.

Control

- Best Control is Prevention
 - Take steps to exclude wild birds and rodents from the poultry house, and prevent the movement of mites from one farm to another on egg flats, racks, other equipment or people.
 - (Although pigeons, starlings and sparrows can be removed readily, birds such as chimney swifts are protected under the 1918 Federal Migratory Bird Treaty Act and cannot be disturbed.)
 - Suggested precautions
 - Isolate infected farms. Control the movement of traffic, equipment, and personnel between clean and infested farms and the hatchery
 - Promptly clean up spilled feed before it attracts wild birds and rodents.
 - Seal any possible entry points by rodents or wild birds
 - Establish a thorough disinfection and treatment program for houses before a new flock is placed.
 - Bring in only uninfested pullets.
 - Monitor birds on a regular basis.
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Surveillance

- Light infestations of mites often go unnoticed and are difficult to identify.
- Once mites are seen on poultry eggs or workers begin to complain of mites, the infestation is usually into the moderate or heavy stage.
- Monitoring birds on a weekly or bimonthly basis is critical to detecting a mite problem early.
- Mite indexing systems have been used for surveillance:
 - Large numbers of birds are examined and assigned various infestation levels
 - OR
 - A “present” or “absent” designation on seven to 30 birds per house weekly.

Treatment

- Management largely consists of whole flock treatments
- Pesticides are applied directly to the birds for control of northern fowl mites and poultry lice.
 - Permethrin, pyrethrins, tetrachlorvinphos, and RaVap (dichlorvos + tetrachlorvinphos) are applied to the birds as well as the premises.
 - Includes dusts (dust boxes) and high-pressure spray (to penetrate past the feathers).
- Extra-label use of ivermectin
 - effective for short periods, but the high dosages are expensive, close to toxic levels, and require repeated use.
- Products used to kill nymph & adult mites; do not kill the mite eggs
 - at least three treatments strategically spaced close together (approx. 3 days apart)
 - [Egg to mature mite as little as 5 days]

***Dermanyssus gallinae* - red mite, roost mite or chicken mite.**

- Although rare in modern commercial operations, this mite is often found in cage-free environments such as breeder or small farm flocks.

Life Cycle & Ecology

- Infests chickens, turkeys, pigeons, doves, canaries, and various wild birds worldwide.
- **Mites are found in masses hiding in crevices and cracks on the poultry house during the day.**
- **Mites attack the birds at night.**
- Eggs (deposited in cracks), larvae (non-feeding), nymphs (feeding), and adults (feeding)
- Life cycle may be completed in only 1 week; thus populations can increase rapidly.
- Adult mites may survive without a blood meal for several months.
 - A house may remain infested for up to 9 months after birds are removed.
- Transmission by contact with infested birds, infested equipment, or by mite dispersion.
- Spread from farm to farm by sparrows, pigeons, rodents, egg flats, bird crates, people, etc.
- In the absence of birds, the mite will attack humans, domestic livestock, and pets.

Pathology

- Low numbers of mites: irritation and annoyance, causing stress, restlessness, fighting, etc. Also, skin irritation, feather-pecking, dermatitis, reduced plumage quality.
- Large numbers of mites (blood feeders) can cause anemia in the chicken, resulting in a pale comb and wattles, weakness, and dullness.
- Mortality, especially of young birds, in cases of extreme infestations
- Economic decreases in egg production, weight gain, and feed conversion.
- Irritation and stress for the farm staff.
- DZ transmission (maybe) – Experimental transmission has been shown, but may not be a significant natural vector. (Eastern, Western, and Venezuelan equine encephalitis viruses, fowl pox virus, and the bacteria *Salmonella enteritidis*, *Pasteurella multocida*, *Coxiella burnetii*, and *Borrelia anserina*.)

Control

- Purchase mite-free birds, and use good sanitation practices to prevent a buildup of mite populations.
- Regularly inspect coop (cracks, crevices, nest boxes, etc.)

Treatment

- Once infested, control may be achieved by targeting the inside of the house and all hiding places for poultry red mite (eg, behind nest boxes, cracks and crevices) with a high-pressure sprayer, as well as, spraying or dusting the birds and litter.
 - Inert dusts can be effective, but application rates need to be high.
 - Systemic control with ivermectin or moxidectin is effective for short periods, but expensive, close to toxic levels, and require repeated use.
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Suborder Astigmata: Mites

Family Sarcoptidae - Sarcoptic itch, scabies mites, mange mites

Sarcoptes scabiei - varieties cause scabies in man, sheep, goats, cattle, pigs, dogs, & horses.

- Tends to be host specific but will transmit between host species.

Notoedres cati - mange of cats.

Morphology --- Round, globular, with numerous seta

Life cycle and epidemiology (*Sarcoptes scabiei* var. *suis*)

- Burrow tunnels in the stratum corneum of the skin in which female deposits eggs.
- Eggs hatch. Larvae migrate to the skin surface and molt twice. Forming 2 nymph stages.
- The adult stage: 4-6 days after eggs hatch and entire life cycle takes 10-14 days.
- Transmitted via contact; mainly by host to host, but fomites may also be involved.
- Live off of host for 5 days in clean dry, hot environ.; but up to 6 weeks in humid, cold environ.

Pathology

- Swine -- Mange concentrated at top of the neck, shoulders, back and ears; but may spread over the entire body. Severe thickening of the skin with fold formation. The skin becomes cracked and thickly encrusted with scabs. Causes severe pruritus, excoriations, pyoderma, weight loss, etc. Economic loss due to damage to equipment as swine scratch.
- Dog
 - Initially on ears, periorbital area, and elbows, as well as the ventral abdomen, chest and legs, but can become more generalized
 - **Intense pruritus** leads to excoriations and bacterial infections & hemorrhagic crusts
 - Primary Lesions: Alopecia, erythema, papular eruptions with thick, yellowish crusts
 - Chronic lesions are mainly due to secondary bacterial and yeast infections
 - Seborrhea, epidermal hyperplasia, severe thickening of the skin with fold formation, crust buildup, peripheral lymphadenopathy, emaciation
- Cattle -- itch mites occur where hair is short, namely, on the brisket and around the base of the tail. Bovine sarcoptic mange is REPORTABLE in many states.
- Sheep -- mange occurs principally around the face and causes "black muzzle".
- Cats -- Notoedric mange begins at the tips of ears and gradually spreads over the face and head.

Diagnosis

- Multiple skin scrapes

Treatment

- Swine -- Must treat sow as she is the carrier for transmission to piglets.
- No products are ovicidal; therefore, multiple treatments will be required for all species.
- Systemics are best if available. (Ex. Avermectins and Fluralaner)

Family Psoroptidae

Otodectes sp. - Ear mite of cats, dogs, rabbits -- ear irritation & scratching injury

Psoroptes ovis – Scab mite of sheep, rabbits, cattle, horses. Prevalent in Southwestern US, rare elsewhere in North America.

Family Knemidocoptidae

Knemidokoptes mutans - scalyleg mites

K. gallinae - depluming mite

Life cycle and epidemiology

- Mites burrow and live in skin and deposit eggs in burrows
- *K. mutans* easily transmitted by contact

Pathology

- *K. mutans* causes a lifting of the scales and a swollen condition of the shank with deformity and encrustation
 - *K. gallinae* causes intense itching, which leads host to pluck its own feathers.
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Suborder Prostigmata: Mites

Family Demodicidae

Demodex canis - red mange of dogs

Morphology -- Elongate mites of the pilosebaceous unit (hair follicle, sebaceous duct, and sebaceous gland)

Life cycle

- Mites live, mate, develop (eggs, nymphs, adults) in the hair follicles and sebaceous glands

Epidemiology

- Small numbers of mites are normal fauna, large numbers can cause mange
- Unlike sarcoptic mange, direct contact with demodectic mangy dogs does not result in demodectic mange
- Pathology occurs when host cannot limit mite population
- Puppies acquire mites at nursing, 1st found in the follicles of the muzzle.
- Direct contact with mangy dogs

Pathology

- Associated with immunosuppressed host (young, hereditary immune defect, or underlying immunosuppressive event [ex. poor nutrition, immunosuppressive drug therapy, or transient stress])

Types of Demodicosis

- Localized Demodicosis -- usually resolves spontaneous as puppy becomes immunocompetent
 - Puppies 3-6 months of age
 - appear as one to five patchy areas of alopecia localized to one region of the body
 - Small-circumscribed areas of alopecia, erythema and scaling on lips, periorbital and front-legs mainly.
 - Other clinical signs are variable: +/- inflammation, +/- comedone formation, +/- follicular papules, pustules, +/- mild pruritus due to secondary bacterial infection

- Generalized Demodicosis (Red Mange)
 - Generalized demodicosis is defined as five or more focal lesions, or two or more body regions affected.
 - Lesions can be anywhere on the body, including the feet.
 - Prognosis guarded, intractable
 - Early Disease
 - Follicular papules, pustules, comedone formation, alopecia, erythema, oily seborrhea
 - As disease progresses
 - pyoderma – pustules rupture, ooze and bad odor. Can cause folliculitis, furunculosis, or cellulitis
 - exudation with thick crusts and ulceration with draining tracts
 - lichenification with skin folds, hyperpigmentation
 - secondary superficial or deep pyoderma.
 - Painful
 - systemic signs may develop.
 - lymphadenopathy, lethargy and fever.
 - bacterial infection may lead to septicemia
 - fatal outcome.
 - An accompanying Demodectic Pododermatitis (Pododemodicosis) is common -- digital, interdigital & plantar – always complicated by 2ndary bacterial infection
- Forms of generalized demodicosis
 - Juvenile-onset generalized demodicosis (usually puppies from 3 to 18 months)
 - As pups get older the localized progresses to generalized severe disease
 - Due to an inherited immunological defect
 - Adult-onset generalized demodicosis (usually older than 18 months)
 - Triggered by immunosuppressive event, such as:
 - Neoplastic processes (lymphosarcoma, melanoma)
 - Debilitating diseases (hyperadrenocorticism, hypothyroidism)
 - Immunosuppressive therapies
 - etc.

Predisposing factors

(a) age, (b) condition (immune suppression), (c) other illness or infection, (d) genetics.

Diagnosis

- Deep skin scrapes or hair plucks
- Treatment success = 2 consecutive negative skin scrapings 1 month apart.

Treatment

- Whole body Amitraz dips every 2 weeks
- Fluralaner (Bravecto)
- Extra-label therapies
 - Macrocyclic lactones: Milbemycin, Moxidectin, Ivermectin
 - Isoxazolines: Sarolaner (Simparica), Lotilaner (Credelio), Afoxolaner (Nexgard)
- Treat secondary bacterial infections aggressively

Contraindication - corticosteroids

Prophylactic

- Dogs with juvenile-onset generalized demodicosis should not be used for breeding
- Parents of such dogs also should not be bred again