Arthropods Affecting Companion Animals

- Mosquitoes
  - Canine heartworm
- Fleas
  - Double-pored tapeworm
- Lice
  - Dermatitis
- Nits
  - Dermatitis

Canine Heartworm

- Canine heartworm is an important filarial parasite of domestic and wild canines in North America.
- Canine heartworm is widely distributed in the US, found in all 50 states.
- Transmission occurs in contiguous 48 states.

Canine Heartworm - Western US

  - California (1,290) - Colorado (299) - Arizona (177) - Oregon (161) - New Mexico (122) - Utah (61) -
    Washington (51) - Montana (27) - Nevada (22) - Idaho (16) - Wyoming (6).
- Montana
  - 25/27 outside the state
  - 2/27 traveled out of state
  - 0/27 no history of out-of-state travel
Canine Heartworm

- Nematode – Onchocercidae (thread-like worms)
  - *Dirofilaria immitis* – canids
  - *D. tenuis* – raccoon
  - *D. striata* – bobcat
  - *D. lattea* – otter
  - *D. subdermata* – porcupine
  - *D. roemeri* – wallaroo
  - *D. ursi* – bear

**Heartworm Life Cycle**

- Mosquito bites dog or cat and transmits infective larvae
- Microfilariae develop in mosquito to infective larvae
- Mosquito ingests microfilariae with blood meal
- Mosquito bites new host and feeds
- Larvae mature into adults in heart
- Female adult worms release microfilariae in blood

![Diagram of heartworm lifecycle](image-url)
Mosquito Vector

- 22 species in US have found to be naturally infected: Aedes, Ochlerotatus, Psorophora, Anopheles, and Culex.
- Primary vector appears to differ geographically.

Objective

- Identify potential vector(s) in MT to possible assist in arresting local transmission.

Methods

- Specimens from July and August were identified to species and processed, placed in vials @ 200 heads per vial.
- DNA extraction by PCR assay.

Results 2005 - 07

- 12 counties
  - Big Horn, Blaine, Broadwater, Carter, Deer Lodge, Flathead, Lake, Lewis & Clark, Missoula, Ravalli, Valley, and Yellowstone
- 2005 (26,798 mosquitoes)
  - Aedes vexans (17,225)
  - Oc. trivittatus (2,913)
  - Oc. incertus (182)
  - Anoph. spp. (172)
- 2007 (39,791 mosquitoes)
  - Aedes vexans (35,307)
  - Oc. trivittatus (1,285)
  - Oc. incertus (2,446)
  - An. punctipennis (204)
  - An. freeborni (186)
**Results 2005 - 07**

- All pools negative for *D. immitis*
- Knapp et al. (1993) 3 yr heartworm survey
- Tested 3,490 canine sera samples
- 24 positive, 2 from dogs with no out-of-state travel history
- While suitable vectors are present in MT, the potential for transmission is low.

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**Canine Heartworm**

**Treatment & Prevention**

*Treatment* — arsenical injections to kill adult worms

*Prevention* — eliminate infective larvae

- Heartgard — bimectin (tablet)
- Heartgard Plus — bimectin + pyrantel pamoate (tablet)
- Heartguard für cats — bimectin (table)
- ProHeart — oxadectin (table)
- ProHeart 6 — metronidazole (injectable)
- Revolution — ivermectin (topical)

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**FLEAS**

**ORDER SIPHONAPTERA**

- 2500 species, 15 families
- 250 Species in North America
- ~95% parasites on mammals
- ~5% parasites on birds
IDENTIFICATION

SENSILUM

CTENIDIA

MOUTHPARTS

ENLARGED LEGS

Flea life cycle

Species of Importance

*Cat* *Fleas*:

- *Ctenocephalides felis*: cat flea
- *C. canis*: dog flea
- *Xenopsylla cheopis*: oriental rat flea
- *Diamonops montanus*: ground squirrel flea
- *Echidnophaga gallinacea*: sticktight flea
- *Tunga penetrans*: chigoe, sand flea

*Pulex* *Simulium*:

- *Pulex simulans*: prairie dog
- *Dopopsylla hirsuta*:
- *Dopopsylla tuberculata*:
**Med Vet Importance**
Humans and Pets

- *Flea Allergy Dermatitis (FAD)*
- Intermediate host
- Vector

**Flea Allergy Dermatitis (FAD)**

- Leading cause of itching in dogs
- Proteins in the saliva cause an intensely itchy response
- A single feeding can cause itching for days.
- Hair loss: middle of the back to the tail base and down the rear legs

**Intermediate Host**
Flea Management and Control

**Non-chemical**

**Indoors**
- Wash and vacuum pet bedding, sleeping areas, carpets, etc.
- Sticky traps, light traps
- Ultrasonic devices (ineffective)

**Outdoors**
- Eliminate rodent habitat

Examples of Flea Control - canines

- Tablets
  - Sentinel - milbemycin oxime + lufenuron (tablet)
- Spot-ons
  - K9 Advantix II - imidacloprid + permethrin + pyriproxyfen
  - Frontline Plus = fipronil + methoprene
- Flea collars
  - Seresto = flumethrin + imidacloprid
- Shampoos
  - Contain pyrethroids
- Dietary supplements
  - Not effective

Med Vet Importance

- **Vector**
  - Murine typhus
  - Tularemia
  - Q Fever
  - Plague
Plague

Historically

• 3 major pandemics in Europe
  • 6th, 14th, 19th centuries
Plague

- Pathogen: *Yersinia pestis*
- Vector: 125 species of fleas
  
  - Oriental rat flea *Xenopsylla cheopis*
  - Prairie dog flea *Oropsylla spp.*

Two forms of plague

- Urban: domestic rats and fleas
- Sylvatic or rural: mammals (mainly rodents) and fleas in rural settings (ground squirrels, rock squirrels, prairie dogs, chipmunks)

Urban Plague

Last urban plague outbreak was
1924-25 in Los Angeles
Rats are very susceptible to the disease

Sylvatic Plague

- Wild rodent populations
- Refractory or highly susceptible
- Deer mice and voles are possible reservoirs
- Cats especially susceptible
Plague Transmission

- Bite of infected flea
- Inhaling infected droplets
- Infected feces ingested or scratched into wound
- Handling infected animals

Infected or Blocked Flea

Clinical types of plague

Bubonic Plague

- Flea transmitted
- Swollen lymph nodes
- 2 to 6 day incubation
- 50 to 60% mortality without treatment
Septicemic plague
- Blood stream is rapidly invaded by bacteria
- Capillaries leak
- 2 to 5 day incubation

Pneumonic plague
- Bacteria enters lungs
- Spread by coughing, sneezing
- 1 to 3 day incubation period

Plague in the US
~ 18 cases per year 1 in 7 die (14%)
Last case in MT 1996
Plague in US

High Risk Groups
- Highest infection rate in Native Americans
- Hunters, veterinarians, pet owners
- Habitat invasion

Plague Prevention

- Environmental Management
  - Control rodent and flea populations
  - Surveillance activities
- Public health education
  - Awareness
  - Media alerts
- Drug therapy
  - Antibiotics (best treatment)
  - Vaccine no longer available in US