ANSC 410 VETERINARY ENTOMOLOGY and PARASITOLOGY
(3 Credits)
T, R @ 10:50 – 12:05
ABB 136

Instructors:
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Dr. Shannon Moreaux (Parasitology)

ANSC 410 Veterinary Entomology

This course will focus on economically important arthropods that spend all or some portion of their lives on wildlife, livestock or companion animals.

Objective: Develop an awareness and understanding of the impact arthropods have on animal production and health.

ANSC 410 Veterinary Entomology

- My motivation
- My qualifications
- Course syllabus
- Grading system
Parasitic Arthropods

Parasite lives directly at the expense of other animals

- Not a commensal relationship
- Degree of harm varies with condition of host and density of parasite

Parasites

1. Ectoparasite
   Live on or burrows into the surface of the skin (e.g., Ticks, flies, etc.)

2. Endoparasite
   Occurs inside the host (e.g., cattle grubs, horse bots)

Ectoparasites

Obligate
- Totally dependent on the host (e.g., lice).

Facultative
- Free-living and parasitic life stages (e.g., mosquito).
What does a parasite derive from its host?

- Food
- Home
- Transportation
- Proliferation
  (growth/multiplication)

Direct Effects on Livestock Health

Blood loss: Tissue invasion
Dermatitis: Envenomation
Allergic responses: Annoyance
Social nuisance: Vector

Effects on livestock health

Blood loss:
- Seepage from wounds
- Up to ½ liter per day by tabanids
Effects on livestock health

Tissue invasion:
Invasion of living tissue by fly larvae

Effects on livestock health

Dermatitis:
- Skin inflammation, hair/plumage loss

Effects on livestock health

Envenomation: stinging, biting insects
Effects on livestock health

Allergic responses:
• Blister beetles and cantharidin

Table 1. Estimated number of beetles for a lethal (1 mg/kg) dose of cantharidin.

<table>
<thead>
<tr>
<th>Cantharidin (mg/beetle)</th>
<th>Horse Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>1200</td>
</tr>
<tr>
<td>Number of Blister Beetles</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>227</td>
</tr>
<tr>
<td>450</td>
<td>719</td>
</tr>
<tr>
<td>1090</td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>23</td>
</tr>
<tr>
<td>45</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td></td>
</tr>
<tr>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

Effects on livestock health

Annoyance:
• Behavior modification
Effects on livestock health

Vector of pathogens:
- Mechanical or biological

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>VECTOR</th>
<th>HOST</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Nile Virus</td>
<td>mosquito</td>
<td>zoonotic</td>
</tr>
<tr>
<td>Vesicular Stomatitis</td>
<td>black fly</td>
<td>cattle, equine</td>
</tr>
<tr>
<td>Buetongue</td>
<td>mosquito</td>
<td>sheep, wildlife</td>
</tr>
<tr>
<td>Epizootic Hemorrhagic Disease</td>
<td>mosquito</td>
<td>human</td>
</tr>
<tr>
<td>Equine Infectious Anemia</td>
<td>mosquito</td>
<td>human</td>
</tr>
<tr>
<td>Canine Heartworm</td>
<td>tick</td>
<td>canine</td>
</tr>
<tr>
<td>Acaplasmosis</td>
<td>tick</td>
<td>zoonotic</td>
</tr>
<tr>
<td>Rocky Mountain spotted fever</td>
<td>tick</td>
<td>zoonotic</td>
</tr>
<tr>
<td>Colorado tick fever</td>
<td>tick</td>
<td>zoonotic</td>
</tr>
<tr>
<td>Relapsing fever</td>
<td>tick</td>
<td>human</td>
</tr>
<tr>
<td>Tularemia</td>
<td>flea</td>
<td>human</td>
</tr>
<tr>
<td>Plague</td>
<td>mosquito</td>
<td>livestock</td>
</tr>
<tr>
<td>Jamestown Canyon</td>
<td>mosquito</td>
<td>livestock</td>
</tr>
<tr>
<td>Cache Valley</td>
<td>mosquito</td>
<td>livestock</td>
</tr>
</tbody>
</table>

Disease impacts on livestock

- Morbidity and mortality
- Cost of recovery
- Quarantine and confinement
- Surveillance activities
- Vaccination programs
- Loss of exports
Direct impacts = economic losses

- Horn fly and stable fly attacks reduce cattle production annually by >$1 billion in US and ~$500 million in Canada.
- House fly #1 nuisance pest in confined animal operations can carry >65 pathogens.
- Millions spent annually on mosquito control in US.
- Economic losses measured in weight reductions, lower milk production, pasture usage, control costs, etc.

ARTHROPOD CLASSIFICATION

- Heirarchical Classification
- Principal Phyla of the Animal Kingdom
  - Phylum Arthropoda
    - Subphylum Chelicerata
      - Class Arachnida
    - Subphylum Mandibulata
      - Class Hexapoda
- Binomial Nomenclature

Heirarchical Classification

- Placement of related organisms in categories or groups
  (Kingdom, Phylum, Class, Order, Family, Genus and Species)
- Members within a group have certain morphological characteristics in common.
- Dozen or so major groups or phyla (phylum).
Principal Phyla of the Animal Kingdom

- Phylum Protozoa - single-celled animals
- Phylum Porifera - sponges
- Phylum Cnidaria - jelly fish, corals
- Phylum Platyhelminthes - flatworms, flukes, tapeworms
- Phylum Nemathelminthes - roundworms
- Phylum Nematoda - rotifers
- Phylum Brachiopoda - brachiopods

Principal Phyla of the Animal Kingdom

- Phylum Bryozoa - moss animals
- Phylum Mollusca - molluscs: clams, snails
- Phylum Echinodermata - starfish, sea urchins
- Phylum Annelida - earthworms, leeches
- Phylum Onychophora - Peripatus
- Phylum Arthropoda - crayfish, millipedes, spiders, insects
- Phylum Chordata - fish, amphibians, reptiles, birds, mammals

Phylum Arthropoda

Organisms united by having the following similar characters

1. Segmented body
2. Paired segmented appendages
3. Bilateral symmetry
4. Chitinous exoskeleton
5. Tubular alimentary canal
6. Open circulatory system
Phylum Arthropoda

Phylum characters – cont.

7. Body cavity = blood cavity
8. Ventral nervous system
9. Striated Skeletal muscles
10. Respiration by gills or trachea

Phylum Arthropoda

- Subphylum Crustacea
- Subphylum Chelicera
  Class Xiphosura - horseshoe crabs
  Class Pycnogonida - sea spiders
  Class Arachnida - spiders, mites, ticks

Phylum Arthropoda

Subphylum Mandibulata
  Class Diplopoda - millipedes
  Class Chilopoda - centipedes
  Class Pauropoda - pauropods
  Class Symphyla - symphytans
  Class Hexapoda – insects (formerly Insecta)
Phylum Arthropoda

- Subphylum Chelicerata
  - Class Arachnida
    - Acarida - hard and soft ticks
    - Mesostigmata - mites
- Subphylum Mandibulata
  - Class Hexapoda
    - Diptera - true flies
    - Phthiraptera - lice
    - Siphonaptera - fleas

Class Arachnida

- Over 100,000 described species
- Ticks and mites
- Adults have 8 legs, some larvae have 6 legs
- Lack antennae and wings
- Body two distinct regions
  - cephalothorax (head and thorax)
  - opisthosoma (abdomen)

Class Hexapoda - Insects

Characteristics of adult:

- Body - three distinct regions
- Head - antennae, mouthparts, eyes
- Thorax - 3 pairs of legs, 1 or 2 pairs of wings
- Abdomen - no appendages, spiracles
Class Hexapoda

- Divided into 30 Orders
- Hundreds of Families
- 800,000 described species
- Largest order Coleoptera (beetles)
- More species of insects than any other kind of organism
- Diversity is incredible

Binomial Nomenclature - system of naming organisms Developed by Carl Linnaeus (Systema Naturae, 1758).

International Code of Zoological Nomenclature

Scientific names (Genus species) are latinized and usually refer to a characteristic of the animal.

Musca domestica house fly Haematobia irritans horn fly

Common names of organisms not covered by ICZN. In U.S. common names of insects are approved by Entomological Society of America