Black Fly
(Buffalo gnats, turkey gnats)

- Order DIPTERA, Family Simuliidae
- Worldwide distribution, 1800 species
- 10 – 20% of economic importance
- Largest genus Simulium
  - 90% are hematophagous
  - 2/3rd feed on mammals, 1/3rd on birds
  - 10% are autogenous

Black Fly Life Cycle

**Eggs**
Dropped in water or attached to vegetation

**Larvae**
Flowing water
Filter feeders

**Pupae**
Cocoon attached to vegetation
non-feeding

**Adults**
Emerge in air bubble

Black Fly

**Adult**
- Small, robust fly, ¼", blackish to yellowish
- Wings smoky or hyaline, never patterned
- Female blood & nectar, males nectar
- Compounds in saliva produce anesthetic effects, vasodilators, and prevents clotting
Black Fly

Adult Behavior

- Flies are daytime feeders
- Feed on thinly haired regions of animal (eyes, ears, nostrils, belly)
- Flies won’t enter shelters (exophilic)
- Adults live < one month

Black Fly

Importance

- Extreme nuisance
- Persistent attackers
- Dermatitis, weight loss, reduced milk production
- Public Health
  - Black fly fever
  - Human onchocerciasis (river blindness)
- Veterinary Health
  - Vesicular stomatitis

Vesicular Stomatitis

- Rhabdoviridae Vesiculovirus, epithelial virus
- 2 serotypes VS Indiana (VSI) and VS New Jersey (VSNJ), Indigenous to Americas
- Epizootic waves start in warmer regions and move north, following rivers and valleys
- Primarily horses, cattle; swine, sheep, wild ungulates susceptible, humans
- Quarantine disease (distinguish from FMD)
VS Transmission

- Primary vector transmitted
  - Black fly, Simulium vitatum
  - 10 day EIP
- Secondary vectors
  - Biting midge, house fly, grasshoppers (?)
  - Isolated from mosquitoes
- Other modes of transmission
  - Feeding equipment
  - Animal health instruments
  - Contact
  - Aerosols

VS Vertebrate Hosts

- Primary hosts
  - Horses, cattle, swine, sheep, goats
- Reservoirs/Amplifying Hosts
  - Unknown
- Serological evidence
  - Deer, antelope, coyotes, bobcats, rabbits, rodents.

VS Clinical signs

- Excessive salivation
- Vesicular lesions tongue, nose, udder
- Virus titer in vesicular fluids, not peripheral blood
- Recovery around 2-3 weeks
### VS Outbreaks in Recent History

<table>
<thead>
<tr>
<th>Year</th>
<th>States</th>
<th>Infected Premises</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>NM, CO, TX</td>
<td>294</td>
</tr>
<tr>
<td>2005</td>
<td>AZ, CO, ID, MT, NE, NM, TX, UT, WY</td>
<td>445</td>
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<tr>
<td>2006</td>
<td>WY</td>
<td>13</td>
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<tr>
<td>2009</td>
<td>NM, TX</td>
<td>5</td>
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<tr>
<td>2010</td>
<td>AZ</td>
<td>2</td>
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<tr>
<td>2012</td>
<td>CO, NM</td>
<td>36</td>
</tr>
<tr>
<td>2014</td>
<td>TX, CO</td>
<td>407</td>
</tr>
</tbody>
</table>

### VS Epizootic 2005

#### Premises Quarantined
- CO: 100
- MT: 46
- NM: 23
- UT: 104
- WY: 199

#### Positive Equines
- CO: 89
- MT: 112
- NM: 27
- UT: 123
- WY: 195

#### Positive Sows
- CO: 40
- MT: 45
- NM: 57
- UT: 57
- WY: 57
VS Treatment

- Vaccines not licensed in U.S.
- Antiseptic mouthwashes
- Soft or liquid feed
- Separate infected animals
- Positive premises quarantined
- Antibiotic therapy for secondary infections

Black Fly Prevention for Horses

- Sprays & wipes (synergized pyrethrins), apply around head and ears (petroleum jelly)
- Provide shelter during the day, adult flies won't enter buildings
- Be vigilant if reports of VS in region

Biting Midges

Order DIPTERA
Family Ceratopogonidae (1400 species)
- Leptoconops
- Forscimapyla
- Culicoides
  - C. varipennis
  - C. oxidentalis
  - C. sonorensis

Vectors of ~35 pathogens, many are hemorrhagic viruses
**Culicoides Life Cycle**

Egg laying sites and larval habitats
Culicoides Life Cycle

- Adults emerge, swarm mating
- Female feed preferentially on ungulates
- Gonotrophic concordance
- *C. sonorensis* has up to 3 generations per year in MT.

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Veterinary Importance

- Annoyance
- Hypersensitivity
  - Equine allergic dermatitis (sweet itch)
  - One species in Montana, *Culicoides stellifer*
- Arbovirus transmission
  - Bluetongue
  - Epizootic Hemorrhagic Disease (EHD)

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Bluetongue Virus

- Reoviridae (*Orbivirus*)
- 26+ serotypes worldwide
- 6 serotypes in US
- Originated in Africa, 1930's
- 1st reported in Texas in 1952 as “soremuzzle” in sheep
- Not a zoonotic pathogen
Bluetongue Virus Transmission

Biological vector in US
- *Culicoides sonorensis*
- Virus acquired in bloodmeal
- Replicates in midgut cells
- Moves to hemocoel
- Infects the salivary glands
- EIP 26 days @ 15°C; 15 days @ 25°C;
  7 days @ 30°C

Bluetongue: Vertebrate Hosts

Sheep
- Usually the most severely affected species
- Asymptomatic or mildly to severely ill
- Morbidity rates as high as 50-75% in susceptible populations
- Mortality rate 30 – 90%

Clinical symptoms

- Swelling of tongue
- Oral lesions
- Hemorrhage
- Lameness
- Pneumonia
- Reproductive deformities
Bluetongue Vertebrate Hosts

Cattle
- <5% show clinical symptoms
- 1-2% seropositive annually in Montana
- Restricted trade to bluetongue-free countries
  - Animals, animal products (embryos, sperm)

Bluetongue: Vertebrate Hosts

BTV in other species

- Goats – minimal clinical signs
- White-tailed, mule deer – 80-90% mortality
- Antelope – 80-90% mortality
- Bighorn Sheep – 0-50% mortality
- Elk – subclinical (same as cattle)

Bluetongue

SHEEP

- Montana 1960's, 2007
  - 16 counties 30-day quarantine
  - BT serotypes 11, 13 and 17
**Bluetongue Management**

- Midge control next to impossible
- Animal treatment
  - Supportive treatment
    - Feed, water, shade, rest
  - Modified-live vaccine
  - Sheep only, serotype 17
  - Wool Growers Vaccine
    - BLUE 10, 11 and 17
    - Used only in rams in Calif.
    - Causes abortions in ewes
- Low volume belly sprays
  - GardStar 40 EC (Y-TEX)
  - Insecticide Ear Tag
  - Python ear tag (Y-TEX)

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**Epizootic Hemorrhagic Disease (EHD)**

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**EHDV**

**Pathogen**

- Reoviridae, Orbivirus closely related to BTV, AHS
- 8 serotypes worldwide (NA, Africa, Asia, Australia)
  - Not reported in Europe
  - 6 serotypes in US
- EHD-2 Alberta strain (isolated in 1992 epizootic, Alberta, CA)

**Vector**

- Biting midge, Culicoides, only proven vector
- Culicoides sonorensis in Montana
- EIP 6 – 8 days @ 25°C.
### EHDV Serotypes Worldwide

![Map of EHDV Serotypes Worldwide]

### EHDV Vertebrate Hosts

- **White-tailed deer**
  - Likely serve as amplifying host
  - Clinical signs of illness in WTD:
    - Fever, inappetence, weakness, hanging of head, labored breathing, swelling around head and neck, internal hemorrhaging, oral bleeding, death (4-10 days)
    - Infected deer found near water
    - No age-preference.
    - Unknown how EHDV overwinters

### EHD Vertebrate Hosts

- Other wild ruminants
  - Mule deer, antelope, elk, bison, and bighorn sheep
  - Cattle and sheep are commonly seropositive
  - 2012 and 2013 EHD outbreaks in cattle in Midwest
  - Clinical signs: fever, inappetence, lethargy, lameness, oral erosions/ulcers, salivation, and reduced milk yield
EHDV

- Cyclical disease in WTD
  2 – 3 yr cycles
- Susceptible population
- Persistent drought
- High vector density
- Vaccine for captive deer

2012 EHD Reported Mortality
As of 10/12/2012

5816 Total Mortalities