Livestock Fly Control

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Extension Livestock Entomologist

Estimated Economic Losses in U.S. Cattle Due to Arthropods

<table>
<thead>
<tr>
<th>Arthropod</th>
<th>Estimated Economic Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horn Flies</td>
<td>$1.36 billion</td>
</tr>
<tr>
<td>Stable Flies</td>
<td>$672 million</td>
</tr>
<tr>
<td>Horse Flies</td>
<td>$296 million</td>
</tr>
<tr>
<td>Face Flies</td>
<td>$191 million</td>
</tr>
<tr>
<td>Ticks</td>
<td>$162 million</td>
</tr>
<tr>
<td>Mosquitoes</td>
<td>$78 million</td>
</tr>
<tr>
<td>Lice</td>
<td>$59 million</td>
</tr>
</tbody>
</table>

Based on Kunz et al. 1991 and adjusted for inflation rates

Damages

Beef producers lose millions of dollars due to arthropod pests by:

- Reduced weight gains
- Less efficient use of forage
- Treatment of diseases transmitted by arthropods
- Direct physical harm or damage
- Cost of trying to control or reduce pest populations

Blood Sucking Flies

- Horn flies
- Stable flies
- Horse and Deer flies

Horn Flies

- Considered the most important external parasite of cattle
- With high summertime populations, they cause cattle to lose weight and lower milk production
- Economic infestations range from 200 to 300 or more flies per animal and usually develop in late May or June and then persist into the fall
- Horn flies reduce beef production efficiency and the economic loss is manifested in growing cattle
- Normally, growing cattle gain an extra 1.5 pounds per week when horn flies are controlled
- Horn flies are a greater problem in pastured cattle because they require a fresh, intact manure pad to complete their life cycle

No, you can’t deduct a banker and three feed salesmen as your dependants!
Horn Flies (cont.)

- Adult horn flies spend their entire lives resting and feeding on cattle, although female flies leave cattle occasionally to lay eggs
- Life cycle development from egg to adult fly requires about two weeks
- Because the horn fly spends all of its adult life on cattle, control with insecticides can be highly effective
- Just as the habits of the horn fly make the pest vulnerable to insecticide treatments, this same behavior can create problems with insecticide resistance
- Continuous use of the same insecticide or class of insecticides will eventually result in fly populations that cannot be controlled

Influence of horn fly infestations on physiological measurements of beef steers. 

<table>
<thead>
<tr>
<th>Item</th>
<th>0</th>
<th>100</th>
<th>500</th>
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</thead>
<tbody>
<tr>
<td>Heart rate /min</td>
<td>76.6</td>
<td>89.1</td>
<td>101.1</td>
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<tr>
<td>Respiration rate / min</td>
<td>44.6</td>
<td>55.7</td>
<td>52.1</td>
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<tr>
<td>Rectal Temp., °F</td>
<td>101.8</td>
<td>102.2</td>
<td>102.4</td>
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<tr>
<td>Water intake, gal./day</td>
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<td>6.6</td>
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<tr>
<td>Urine output, gal./day</td>
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<td>1.1</td>
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<tr>
<td>Feed intake, lbs. DM/day</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
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<tr>
<td>Nitrogen intake, grams/day</td>
<td>30.9</td>
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<td>34.8</td>
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<tr>
<td>Urine nitrogen, grams/day</td>
<td>24.6</td>
<td>31.1</td>
<td>34.7</td>
</tr>
<tr>
<td>Nitrogen retained, grams/day</td>
<td>63.6</td>
<td>50.2</td>
<td>49.5</td>
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</table>

- Byford et al., 1992 and Schwinghammer et al., 1986
- Row values differ (P = 0.05)
- Row values differ with different superscript (P = 0.05)

Horn fly insecticide resistance management (cont.)

4. If additional horn fly control is needed later in the year, use sprays, pour-ons, dusts or backrubbers. If possible, alternate insecticide classes when changing control methods.
5. If pyrethroid ear tags have failed to control horn flies in the previous year, pyrethroid insecticides in any form should not be used for at least two years. In the meantime, use non-pyrethroid ear tags, sprays, pour-ons, etc.

Pyrethroid Tags: Organophosphate Tags:
- No more than once every three years
- Do not use more than two years in a row

Ideal Rotation for Horn Fly Control

- Chlorinated hydrocarbon → Organophosphate → Pyrethroid → Abamectin
- Why?
  - Chloride channel antagonist (CH) Resistance Group 2 (Avenger)
  - Cholinesterase inhibitors (OP) Resistance Group 1 (Corathon)
  - Sodium Channel Modulators (P) Resistance Group 3 (Cyguard)
  - Chloride Channel Modulators (AB) Resistance Group 6 (XP 820)
Organophosphate Products (OP)

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Active Ingredient</th>
<th>Color</th>
<th>Applicator gun</th>
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<tr>
<td>Warrior</td>
<td>30% Diazinon</td>
<td>Green</td>
<td>Y-Tex</td>
</tr>
<tr>
<td></td>
<td>10% Chlorpyrifos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimizer</td>
<td>21.4% Diazinon</td>
<td>Orange</td>
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</tr>
<tr>
<td>Dominator</td>
<td>20% Pirimiphos</td>
<td>Yellow</td>
<td>Allflex</td>
</tr>
<tr>
<td>Patriot</td>
<td>40% Diazinon</td>
<td>Orange</td>
<td>Allflex</td>
</tr>
<tr>
<td>Terminator II</td>
<td>20% Diazinon</td>
<td>Red</td>
<td>Allflex</td>
</tr>
<tr>
<td>Corathon</td>
<td>15% Coumaphos</td>
<td>Slate Green</td>
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</tr>
<tr>
<td></td>
<td>35% Diazinon</td>
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</tr>
<tr>
<td>Double Barrel VP</td>
<td>6.8% Lambdacyhalothrin</td>
<td>Red</td>
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<tr>
<td></td>
<td>14.4% Pirimiphos Methyl</td>
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</table>

Other Chemistries

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<tr>
<td>Avenger (CH)</td>
<td>30% Endosulfan</td>
<td>Grey</td>
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</tr>
<tr>
<td>XP 820 (Ab)</td>
<td>Macrocyclic lactone</td>
<td>Gold</td>
<td>Y-Tex</td>
</tr>
<tr>
<td></td>
<td>Abamectin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pipronyl Butoxide</td>
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<td></td>
</tr>
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Pyrethroid Products (P)

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<th>Applicator gun</th>
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<td>Python</td>
<td>20% Piperonyl Butoxide</td>
<td>Lavender</td>
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</tr>
<tr>
<td></td>
<td>10% Betacyfluthrin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Python Magnum</td>
<td>20% Piperonyl Butoxide</td>
<td>Blue</td>
<td>Y-Tex</td>
</tr>
<tr>
<td></td>
<td>10% Betacyfluthrin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardstar Plus</td>
<td>10% Permethrin</td>
<td>Red</td>
<td>Y-Tex</td>
</tr>
<tr>
<td>Saber Extra</td>
<td>10% Lambdacyhalothrin</td>
<td>Purple</td>
<td>Allflex</td>
</tr>
<tr>
<td>CyLence Ultra</td>
<td>Synergized Pyrethroid</td>
<td>Light Blue</td>
<td>Allflex</td>
</tr>
<tr>
<td>CyGuard</td>
<td>15% Betacyfluthrin</td>
<td>Clay</td>
<td>Allflex</td>
</tr>
</tbody>
</table>

Which animals should receive tags?

YES
- Heifers
- Cows
- Weaned calves

NO
- Calves still on their mother
- Bulls during breeding season

100+ Flies
Comparison of commercially available insecticide ear tags for horn fly control Stillwater, OK 2007

<table>
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<tr>
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<th>5a</th>
<th>6a</th>
<th>8a</th>
<th>9a</th>
<th>10a</th>
<th>11a</th>
<th>12a</th>
<th>13a</th>
<th>14a</th>
<th>15a</th>
<th>16a</th>
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<tbody>
<tr>
<td>Control</td>
<td>265 a</td>
<td>266a</td>
<td>289a</td>
<td>322a</td>
<td>437a</td>
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<td>860a</td>
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<td>1.5a</td>
<td>96a</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Corath</td>
<td>19 b</td>
<td>24b</td>
<td>14b</td>
<td>12b</td>
<td>9 b</td>
<td>5 c</td>
<td>19 b</td>
<td>37 b</td>
<td>79 d</td>
<td>129 b</td>
<td>420 b</td>
<td>525 b</td>
<td>370 c</td>
<td>253 c</td>
<td>390</td>
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<td>P9820</td>
<td>17 b</td>
<td>1b</td>
<td>9b</td>
<td>9b</td>
<td>1b</td>
<td>7c</td>
<td>13 b</td>
<td>76 b</td>
<td>150 c</td>
<td>151 c</td>
<td>129 c</td>
<td>128</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Means followed by the same letter are not significantly different. Tukey’s LSD, P<0.05.
Comparison of commercially available insecticide ear tags for horn fly control Muskogee, OK 2009

<table>
<thead>
<tr>
<th>Trt</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 8</th>
<th>Week 9</th>
<th>Week 10</th>
<th>Week 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>78 b</td>
<td>86 b</td>
<td>117 b</td>
<td>189 b</td>
<td>186 b</td>
<td>177 b</td>
<td>163 b</td>
<td>160 b</td>
<td>177 b</td>
<td>189 b</td>
</tr>
<tr>
<td>Patriot (OP)</td>
<td>8 c</td>
<td>10 c</td>
<td>15 c</td>
<td>29 c</td>
<td>57 c</td>
<td>43 c</td>
<td>75 c</td>
<td>103 c</td>
<td>69 c</td>
<td></td>
</tr>
<tr>
<td>GuardStar (P)</td>
<td>125 a</td>
<td>169 a</td>
<td>240 a</td>
<td>388 a</td>
<td>437 a</td>
<td>495 a</td>
<td>587 a</td>
<td>820 a</td>
<td>845 a</td>
<td>930 a</td>
</tr>
<tr>
<td>XP-820 (Ab)</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
</tr>
<tr>
<td>Avenger (CH)</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>0 d</td>
<td>26 d</td>
</tr>
</tbody>
</table>

*Means followed by the same letter in the same column are not significantly different. Turkey’s LSD; P<0.05.

OP = Organophosphate; P = Pyrethroid; Ab = Abamectin; CH = Chlorinated Hydrocarbon

Fly Control Cost

<table>
<thead>
<tr>
<th>Avenger</th>
<th>XP E2O</th>
<th>Cy Guard</th>
<th>Corathon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endosulfan</td>
<td>Abamectin</td>
<td>5th Gen. Pyrethroid</td>
<td>Organophosphate</td>
</tr>
<tr>
<td>$4.06 / hd</td>
<td>$4.30 / hd</td>
<td>$4.40 / hd</td>
<td></td>
</tr>
</tbody>
</table>

Mineral Cost for IGR + Anaplas/ 5 months $22.50 / hd

Dust Bag Application/ 5 months $1.75 / hd

Cattle Rug/ 5 months $2.61 / hd

Best Management Practice
2 R’s

• Rotate
• Remove

• Don’t use more than one product per herd

Stable flies

• Stable flies, Stomoxys calcitrans, (L.) (SF) originated in Africa and were dispersed throughout the world due to livestock and human movement

• Stable flies were reported as early as 1776 in the United States

• Stable flies can be distinguished between other genera in the family Muscidae by the rigid non-retractable proboscis

Stable flies (cont.)

• Stable flies are a pest that has been known mainly to affect cattle in feedlots

• In the past two decades, stable flies have become a serious pest affecting pastured cattle

• Grazing steers exposed to stable flies for an extended period weighed an average of 37 lbs less than steers that were protected by repeated insecticide treatments (Campbell, et al. 2001)
Round Bale Feeding Sites as Sources of Stable flies in pastures

- Fecal matter mixed with soil and plant matter is an ideal larval habitat for stable fly
- Round bale feeding sites provide ideal substrate for stable fly development
- 4,866 SF/m²/week in North Central Kansas and South Central Kansas (Broce et al. 2005)
- On average a typical ring type feeder can provide up to 12 m² of hay residues
- Potentially providing enough breeding habitat for ~ 58,000 SF/week

Stable Fly Control

- Spraying cattle with recommended insecticides is somewhat effective in controlling stable flies, but most chemicals approved for this use have a short-lived effectiveness
- Sanitation is an effective management practice that reduces stable flies by eliminating their breeding habitat
- Unrolling round bales is an effective method in reducing stable fly habitat areas

Horse and Deer Flies

- Horse and Deer flies are often referred to as tabanids
- Only females feed on cattle
- Occasional pest but when outbreaks occur they can cause significant losses
- Proven mechanical vector of anaplasmosis
- Most difficult fly pest to control since only the females spend a few minutes on cattle and the remainder of their life cycle is spent off the host
- Most successful technique of control is herd management by locating cattle away from tabanid breeding habitats and wooded areas

Important fly species associated with horse farms

- Horse bot fly
- Mosquito
- Stable fly
- Black fly
Tabanids
- More commonly known as deer flies and horse flies
- Blood sucking pest
- Only females feed on horses
- Larvae develop in aquatic or semi-aquatic areas
- Usually just one generation per year but can vary between species
- Bites are extremely annoying and painful to horses
- Are mechanical vectors of Equine Infectious Anemia virus
- Control:
  - Frequent use of a pyrethroid-based insecticide formulated with a repellent
  - Locate animals away from wooded areas during peak tabanid activity
  - Most tabanid flies do not enter barns so stabling your horses during peak activity can be beneficial

Biting Midge
- More commonly known as “no-see-ums”
- Blood sucking pest
- Very small (1/16 – 1/8 inch)
- Only females feed on horses
- Prefer to feed on calm windless nights
- Many different species with diverse larval habitats
- Usually has multiple generations per year
- Can cause hypersensitivity in horses
- Control:
  - Stabling horses during peak activity (calm nights) provides protection
  - Biting midges are weak-flying insects so fans can be helpful
  - Insecticide treated screens can provide a protective barrier

Sweet Itch
- Biting midges of the genus Culicoides are the primary cause of a seasonal recurrent allergic dermatitis known as sweet itch
- Also known as summer eczema
- The symptoms occur at the feeding sites of Culicoides spp. along the mane, withers and base of the tail.
- rCul s 1 is the first specific salivary allergen of C. sonorensis to be described that promises to advance diagnosis and may contribute to the development of immunotherapy for summer eczema in horses

Stable flies
- Resembles a house fly but have rigid piercing mouthpart that protrudes forward
- Blood feeder
- Optimum habitat for larval development are areas of hay/feed being mixed with manure
- Multiple generations per year
- Both males and females feed on horses
- Preferred feeding sites are the legs or underside of the animal
- Bite is painful and results in leg stomping behavior in horses
- Control:
  - Most effective measure is the removal of larval habitats such as spilled feed or hay
  - Residual insecticide applications should be directed towards the legs
  - Stable flies rest on vertical surfaces such as barn walls so residual insecticide could be directed in those areas
House flies

- Non-biting fly
- Medium sized fly (3/8 inch)
- Larvae develop in many sources but are most commonly found in decaying organic matter and prefer manure
- Cause stress to horses by feeding on eye secretions
- Large populations can create problems with non-agricultural neighbors

House flies (cont.)

- Control:
  - Sanitation is a key component to reducing house fly population
  - Chemical control strategies are helpful but should always be combined with routine sanitation practices
  - Residual sprays applied to barn walls can also limit house fly populations
  - Fly baits, strips, sticky traps, and electric grids can be helpful in enclosed spaces
  - Fly masks will limit the irritation house flies cause to horses

Bot flies

- Large flies that are bee-like in appearance
- Larval stage causes injury in horses
- Life cycle takes approximately one year
- Adult flies attach their eggs to the horse’s hair
- Larvae (bots) burrow into the lips and tongue causing temporary irritation
- Larvae then migrate to the stomach and remain there for up to 10 months

Bot flies (cont.)

- Larvae travel through gut and are excreted with the manure
- Larvae pupate in the ground for one to two months
- Control:
  - Many of the currently available endectocides for the treatment of internal parasites as well as the oral treatments will control horse bots when routinely applied
### Costs of Bio-control Program

<table>
<thead>
<tr>
<th>Horses</th>
<th>Fly Predators/mo.</th>
<th>Cost</th>
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<tbody>
<tr>
<td>1-5</td>
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<tr>
<td>100-125</td>
<td>$1.76/hd/mo. + $6.50 shipping</td>
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### Chemical control

Automated Insect Control Systems:
- Primarily utilize pyrethrins or pyrethroids
- Cost range depends on the size of barn
- Filters are key components in maintaining the system
- Resistance can become a major issue since the only products approved for this type of application are in the same chemical class

### Fly Collars

- Mixed Reviews!
- Special consideration:
  - Check for skin sensitivity
  - Check after it rains
  - Check safety latches

### Pest management strategies for common fly pests of horses

<table>
<thead>
<tr>
<th>Management Strategy</th>
<th>Table:</th>
<th>Non- attractiveness</th>
<th>Disruption</th>
<th>Residue</th>
<th>Presence of larvae</th>
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</tr>
</tbody>
</table>

*Note: Certain strategies may not be applicable in certain scenarios.*
Nose Bot Fly

- The female nose bot fly, *Oestrus ovis*, deposits living larvae (maggots) in or around the nostrils of sheep during the spring and summer months.
- When flies are attacking sheep, the animals bunch together and keep their noses to the ground in an effort to avoid the strikes.
- The larvae migrate through the nostrils into the head sinuses, bronchi, or cavities in the horns or bones of the jaw or nose, where they feed on the internal secretions.
- Migration of the larvae irritates the nasal membranes and is often followed by secondary infections.

Keds

- Sheep keds are one of the primary pests of sheep.
- The adult is actually a wingless fly resembling a tick in appearance. The adults are grayish-brown, sixlegged, and 1/4 inch long with a broad, leathery, somewhat flattened, unsegmented, saclike abdomen covered with short spiny hairs.

Nose Bot Fly

- Infested sheep shake their heads, stamp their feet, or hold their noses to the ground.
- Sneezing and labored breathing can be common among infested sheep.
- Blood flecks in the nasal discharge, and goats banging their heads against feed bunks, fences, or the ground indicate the presence of nose bots.
- Severely infested, older, or weak sheep may die as a result of the bots.
- The larvae develop during the winter; the following spring they are sneezed out or drop out to the ground, where they pupate and become adults.

Keds

- Sprays, dips, pour-ons, and dusts are all effective for control of sheep keds.
- If animals are heavily infested in fall or winter months it is advisable to treat them.
- If you spray during fall or winter, select a warm, sunny day. Treat the animals in the morning, and keep them outside until they dry. To reduce the chances of illness, do not let wet animals crowd into a warm building.
- Application equipment that provides a nozzle pressure of at least 50 psi is adequate for ked and louse control.
- To ensure adequate and thorough dosage, do not spray more than 5 or 10 animals at a time. Confining animals in a relatively small area so they will rub against each other and maximize the effectiveness of the materials being sprayed.
- Spray the animals until they are thoroughly wet.