Parasite Control & Being a Good Steward: Tips to Implementing New Research Findings (Crystal Ball Stuff)

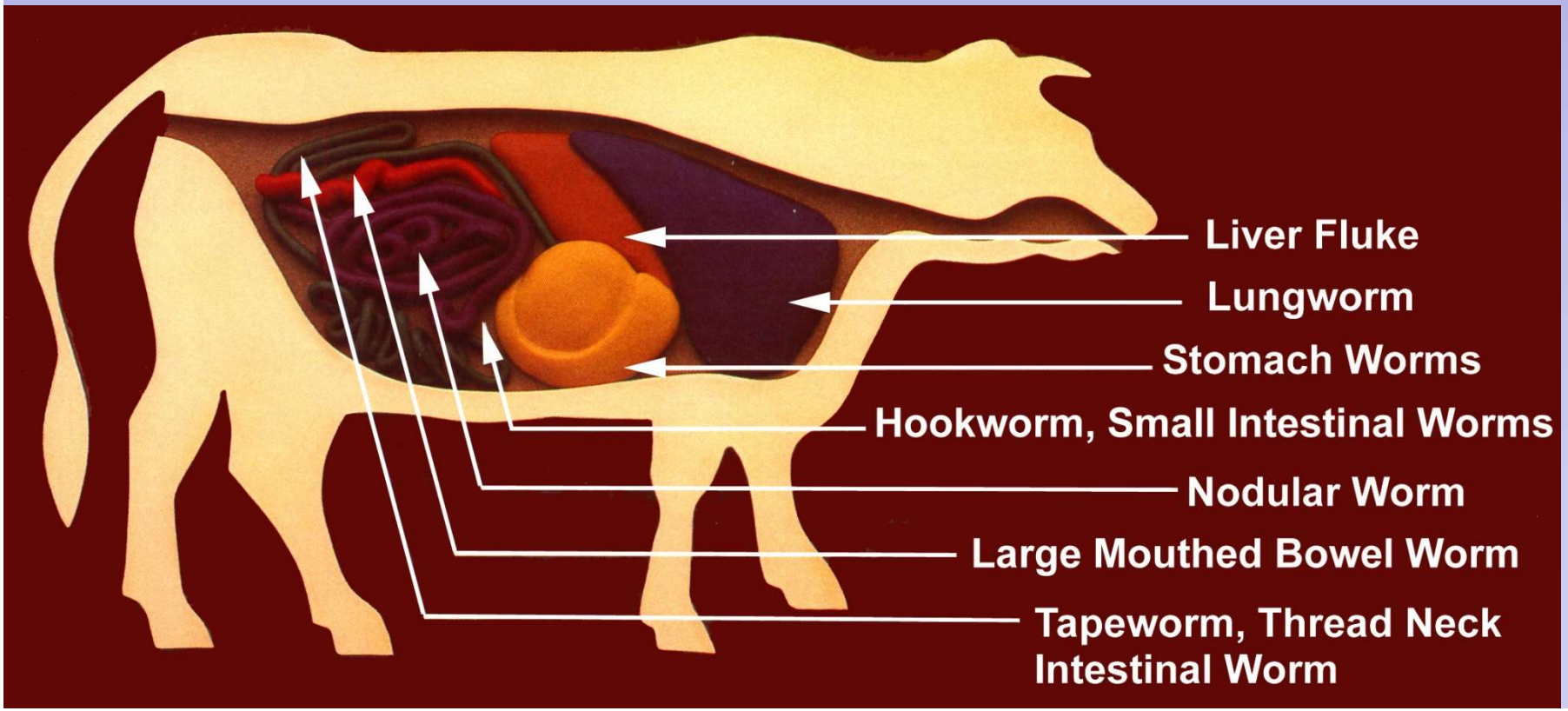
michael.hildreth@sdstate.edu
605-691-9073
Departments of Veterinary & Biomedical Sciences and Biology & Microbiology

CATTLE PARASITES

WORMS
- Flukes (Trematodes)
- Tapes (Cestodes)
- Roundworms (Nematodes)

GERMS (Protozoans)
- Crypto (Cryptosporidium)
- Coccidia (Eimeria)

BUGS
- Flies (adult Dipterans)
- Grubs (larval Dipterans)
- Lice (Sucking and Biting)
- Mites



Avermectin Resistant Long-nose Cattle Lice in a South Dakota Charolais Herd

Figure 3. Short-nosed cattle louse

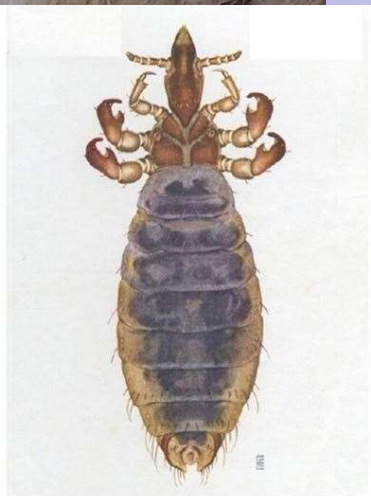


Figure 4. Long-nosed cattle louse.

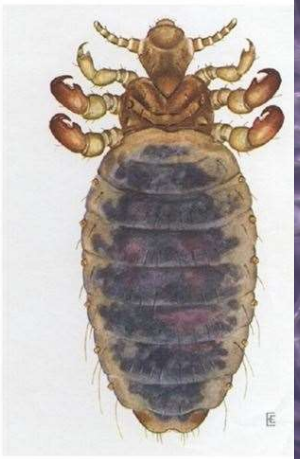


Figure 5. Little blue cattle louse

Treated:

- **An avermectin pour-on mid November'**
- **Avermectin pour-on <u>and</u> injectable mid December**

Approaches to Treating Lice on Cattle

Entirely Dependent on Pesticides

Types of Applications:

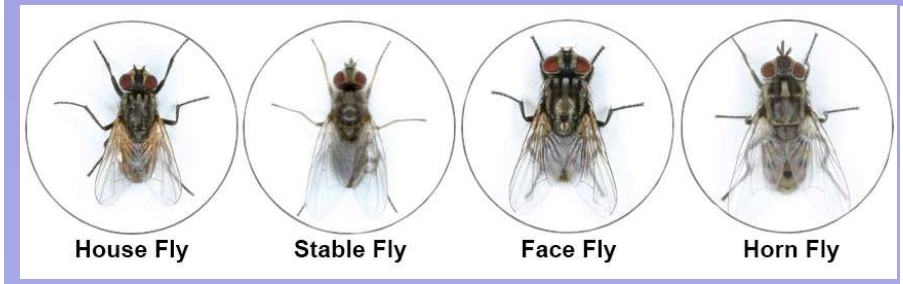
- **Sprays & Dusts (& Fogs?) – (Insecticides)**
  - Permethrin -
  - Malathion ?? -
- **Pour-ons –**
  - Macrocyclic Latones – systemic: sucking & biting lice
    - Avermectins – Ivermectin, Doramectin, etc.
    - Milbemycins – Moxidectin
  - Permethrin – non-systemic
  - Insect Growth Regulators (IGR) – combined with permethrin - sucking & biting lice
- **Injectables (endectocides)**– better on sucking lice
  - Macrocyclic Lactones
    - Avermectins – Ivermectin, Dormamectin, etc.
    - Milbemycins - Moxidectin

- Studies on controlling pesticide resistance take years to get results
- Computer models are commonly used
- Models can't show any delay in resistance from rotating classes of pesticides
- Models show advantages with combination

Rotating insecticide & Anthelmintic Classes is "out"; Combinations are "in"

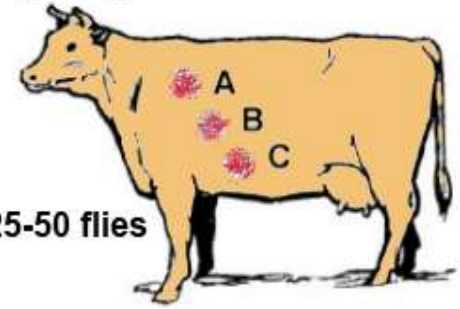
Combining Insecticide Classes

ACTIVE INGREDIENTS:	
Diflubenzuron [CAS # 35367-38-5]	3.0%
Permethrin [CAS # 52645-53-1]	5.0%
OTHER INGREDIENTS*:	92.0%
Total:	100.0%

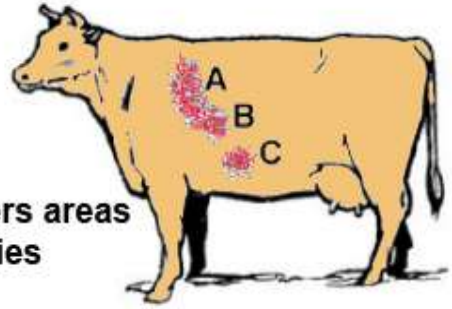


Haematobia irritans irritans **(Horn Fly)**

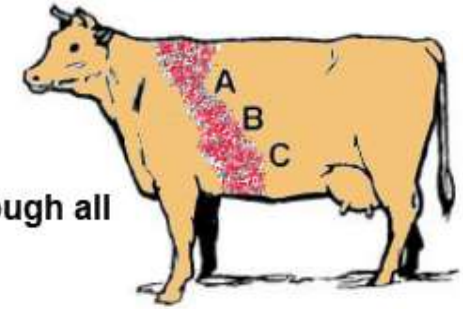
Guide to Estimating Fly Numbers



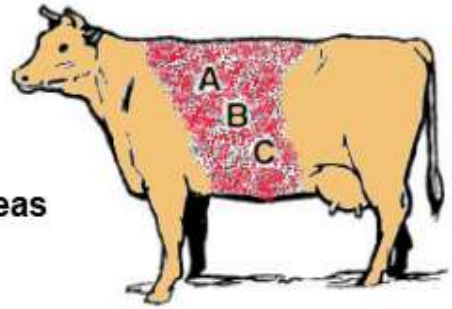
Level 1:
A single small patch of flies = 25-50 flies located in area A, B or C



Level 2:
A single patch of flies that covers areas A and B or B and C = 100-125 flies



Level 3:
The patch of flies extends through all 3 areas = 200-350



Level 4:
The patch of flies covers all areas extensively

"Control" of Horn Flies
Mostly Dependent on Insecticides

- Sprays
  - High Pressure
  - Low Pressure
- Insecticide Impregnated Ear Tags
  - Organophosphates
  - Pyrethroids
  - Organochlorines
  - Macrocyclic Lactones
- Bags and Rubs
- Mineral Blocks and Feed Additives (Larvacides)
- Traps

Bruce Walk-in Horn Fly Trap

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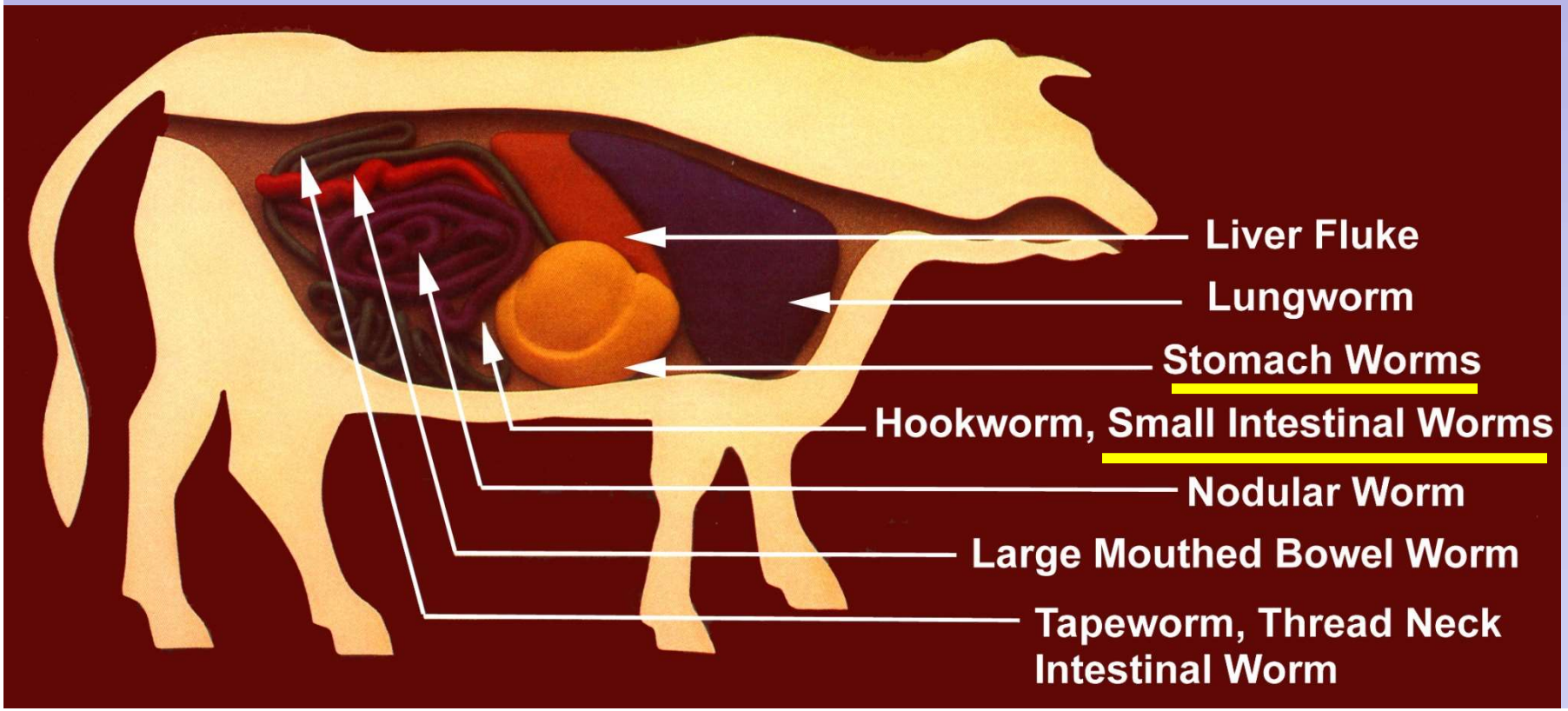
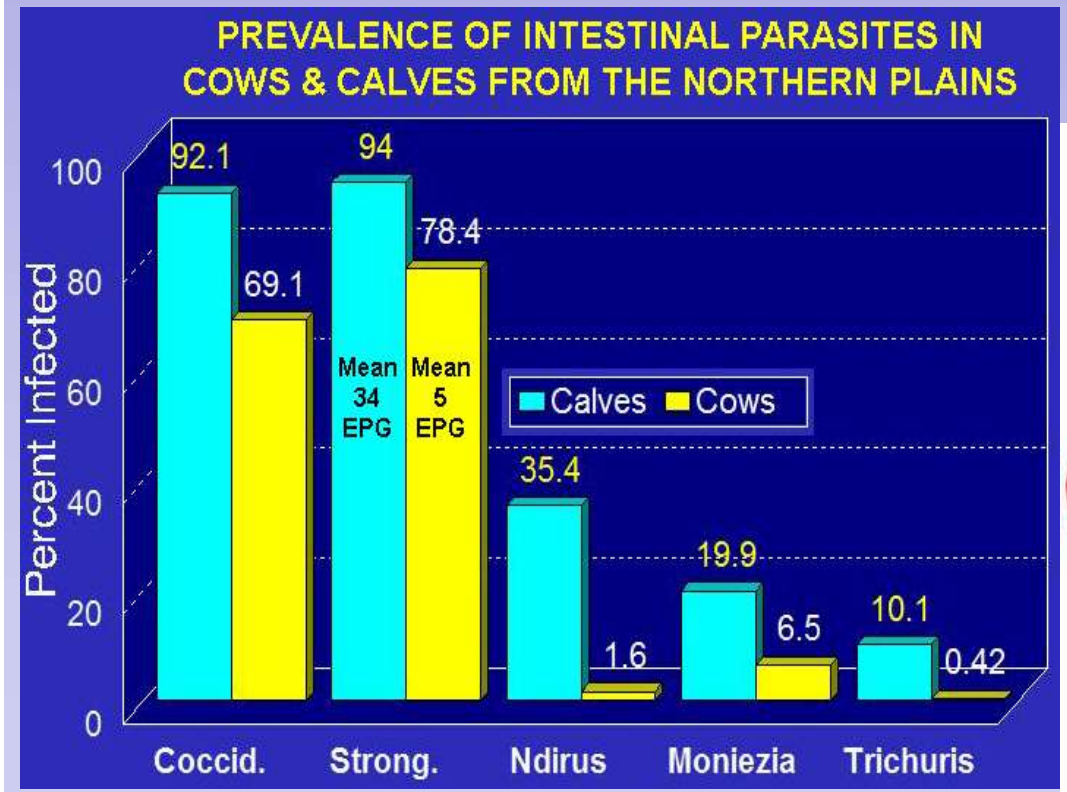


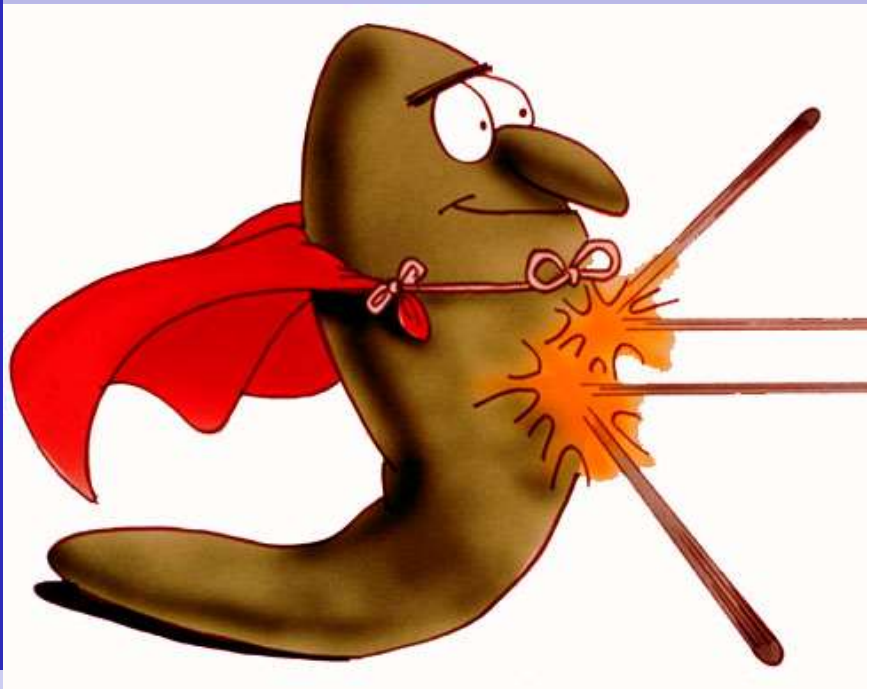
CATTLE ~~WORMS~~ WEEDS

(Trichostrongyle Nematodes)

In only 1 fecal sample, it is possible to detect trichostrongyle nematodes in virtually all ruminants with access to grass anywhere in the world



- You can't eliminate them, but you can manage them

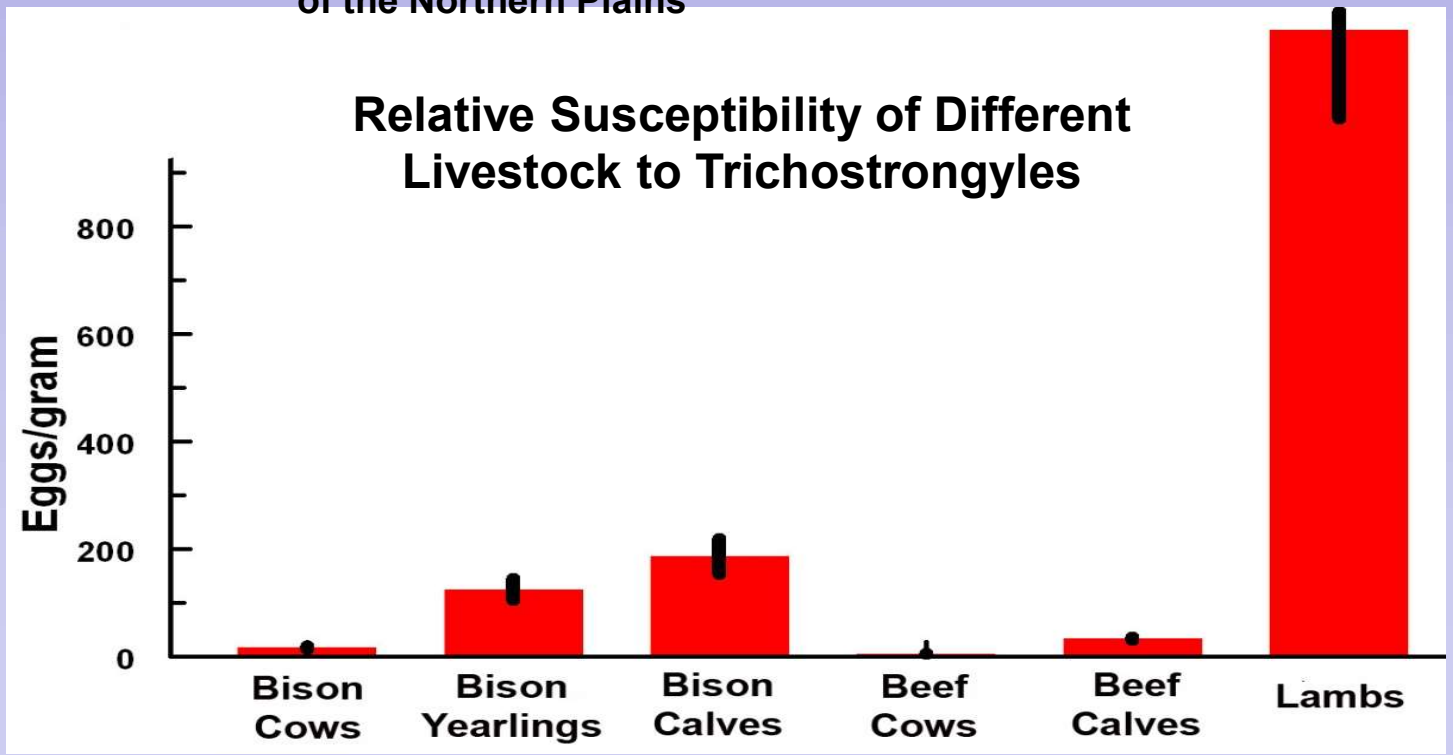


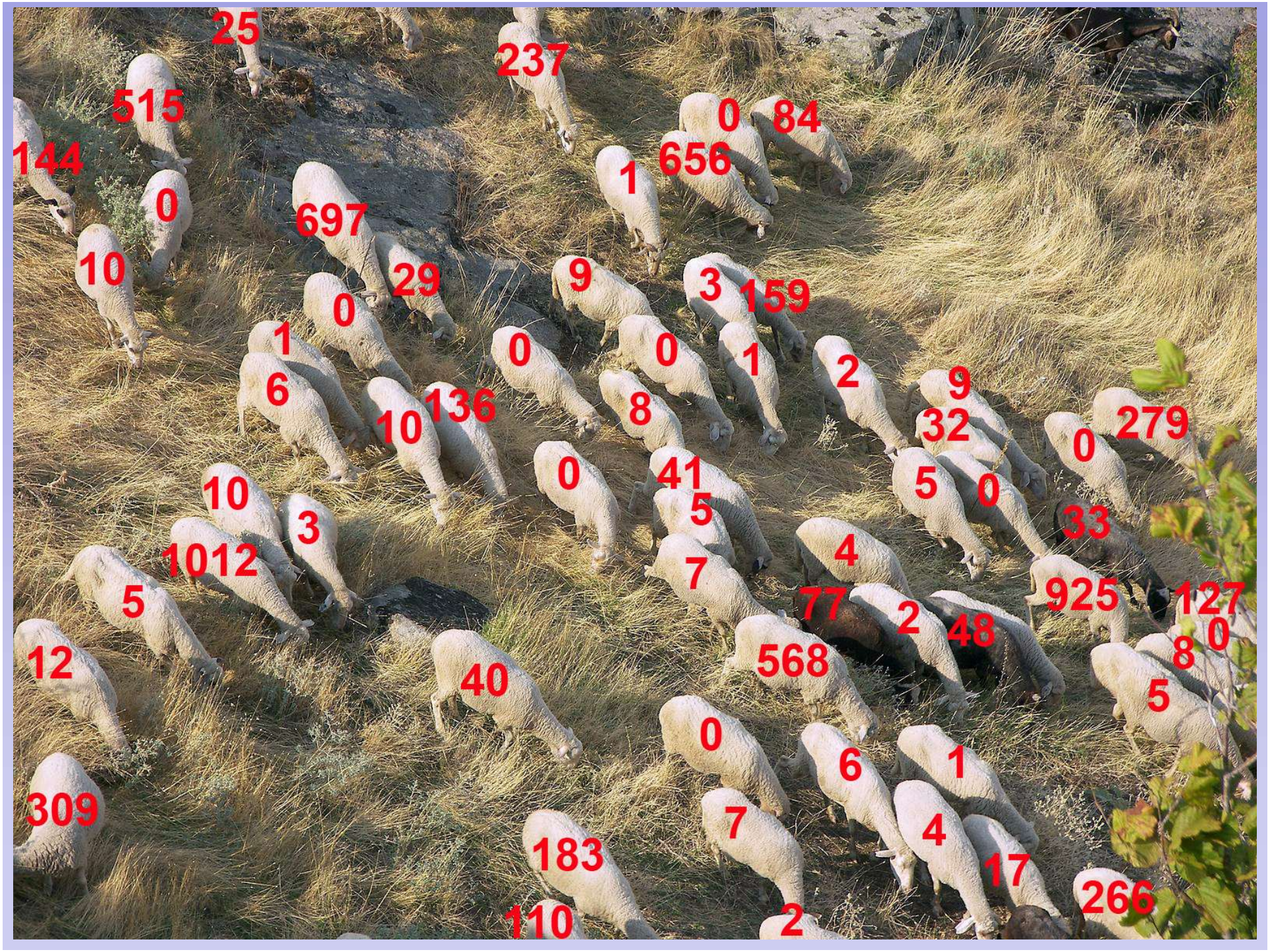
Goats:
- Extremely Susceptible
- Control measures needed in all areas of South Dakota

Sheep:
- Very Susceptible
- Control measures needed in most areas of the Northern Plains

Bison:
Moderately Susceptible

Cattle:
- Moderately Susceptible
- Control measures for economic gains only




25
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925
127
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40
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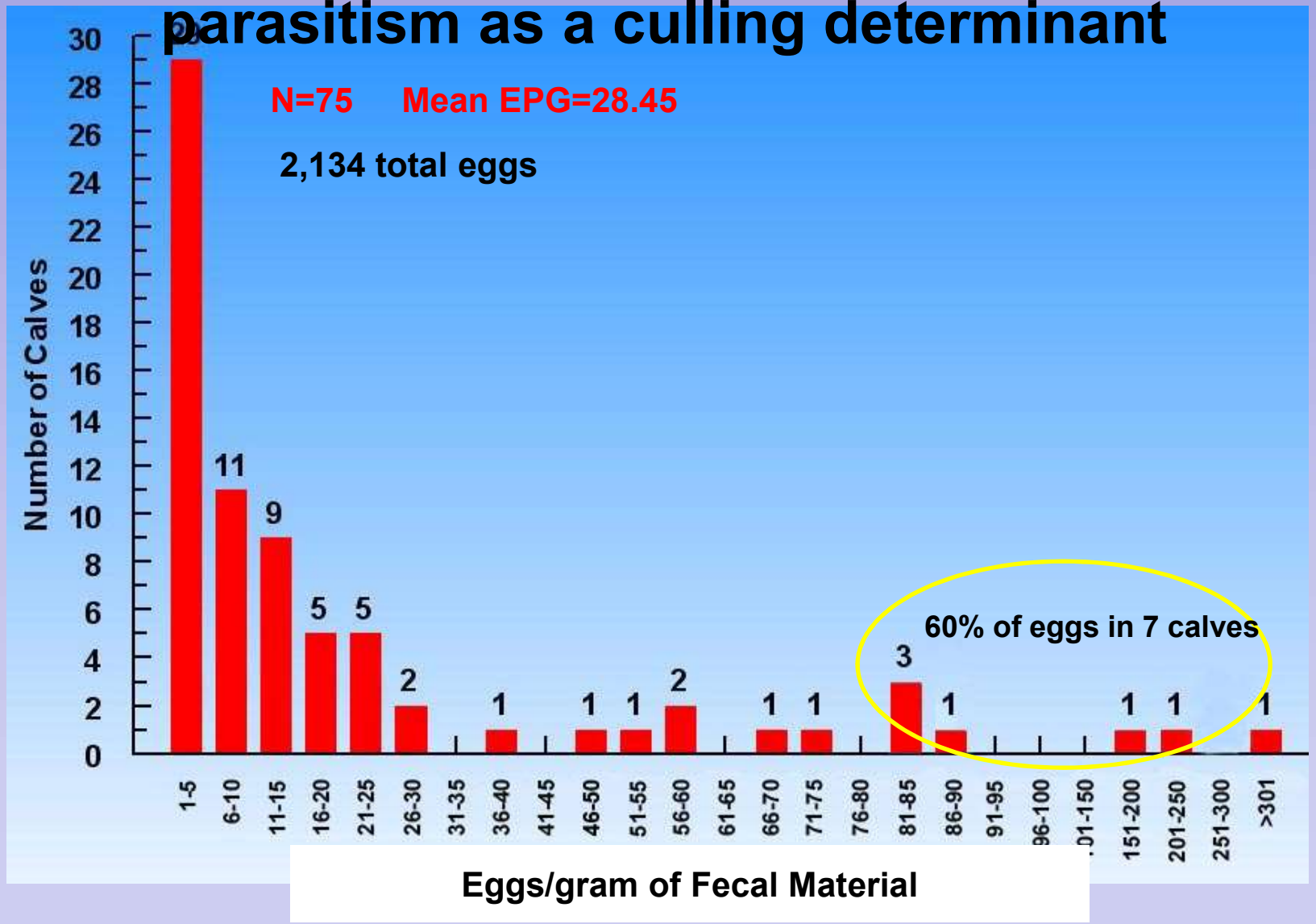
266
110
2

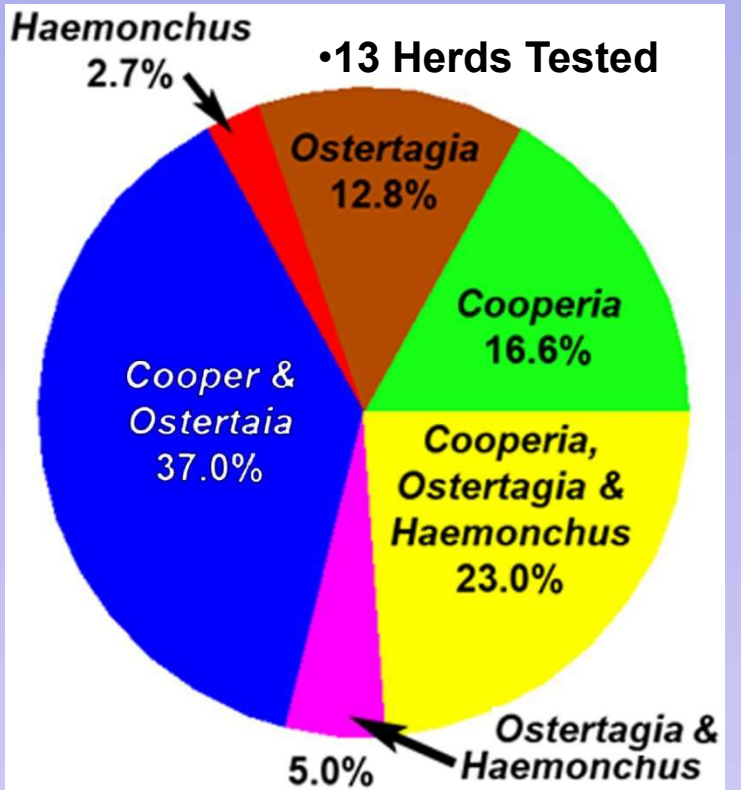
Aggregation of nematodes in a herd population creates the opportunity to use parasitism as a culling determinant

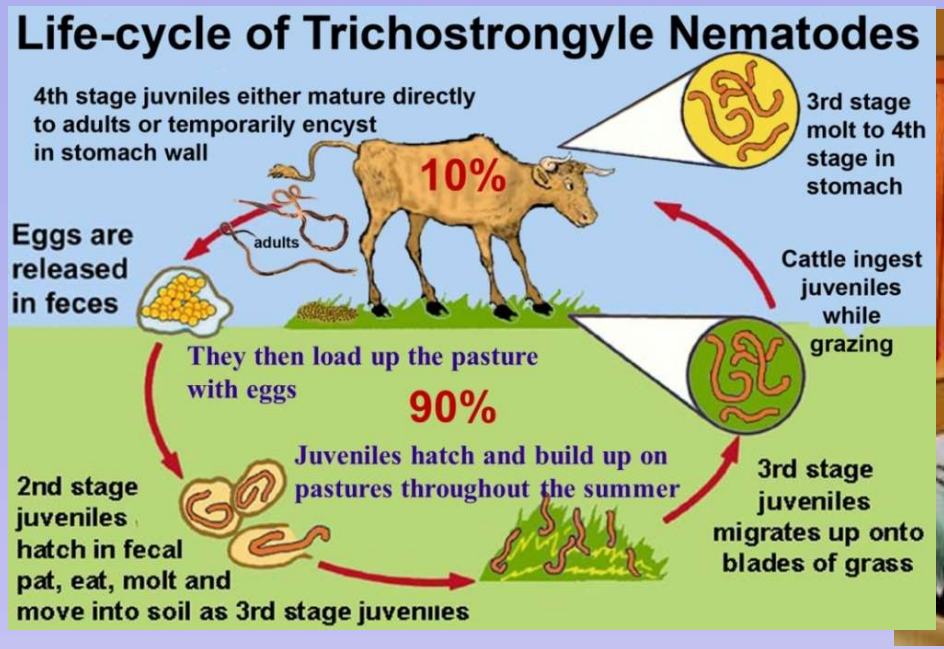


Trichostrongyle Genera in Beef Calves from Eastern South Dakota

HOTC Complex

- ***Haemonchus placei*** (Cattle) or ***H. contortus*** (Sheep)
  - Parasitizes the abomasum (stomach)
  - Most deadly trichostrongyle also production losses
  - More common to wet and warm climates
- ***Ostertagia ostertagi***
  - Can raise pH of the stomach and clinical problems
  - Causes production losses
  - Commonly found in South Dakota cattle
- ***Trichostrongylus spp.***
  - Parasitizes stomach or intestine
  - Rare in South Dakota cattle; very common in sheep
  - Causes production losses
- ***Cooperia spp.***
  - Commonly found in South Dakota cattle
  - Causes production losses, but not clinical problems





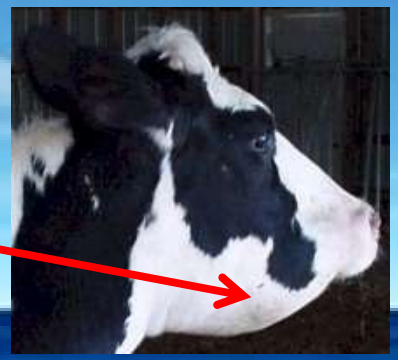
- *Ostertagia* & *Cooperia* 3rd stage juveniles can survive adverse environmental conditions in the soil
- They can easily survive S.D. winters
- *Haemonchus* cannot survive S.D. winters and struggle more during dry summers
- All trichostrongyle 4th stage juvenile can survive in the wall of the gut

CLINICAL PARASITISM

Haemonchus

Rare in South Dakota

- Sudden Death
- Anemia
- Diarrhea / Loose stools
- Weakness
- Bottle jaw



Problems caused by Trichostrongyle Infections
Vary depending on species and intensity

Ostertagia* and *Cooperia

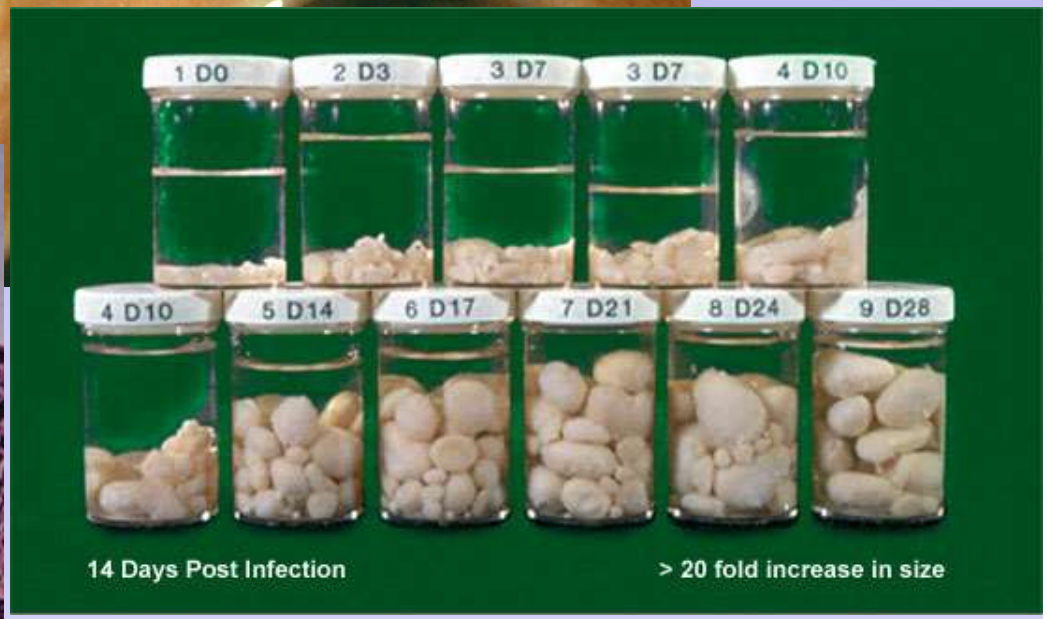
SUBCLINICAL PARASITISM

- Reduced Appetite
- Reduced weaning wt.
- Reduced reproductive performance
- Reduced milk production
- Reduced growth rate
- Increased susceptibility to disease

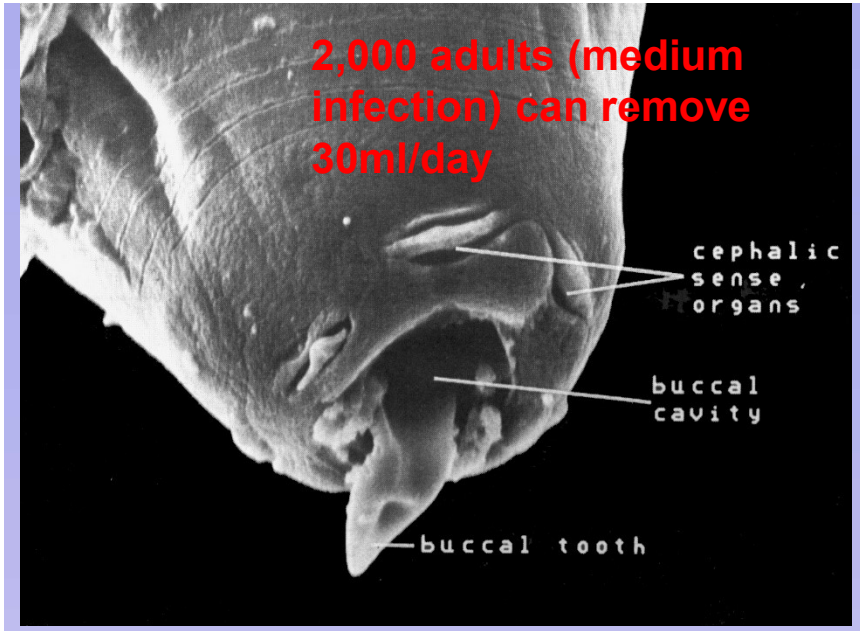
HOUSING COSTS

Ostertagia (Brown Stomach Worm)

Infected Abomasum



Juveniles live in the gastric glands of the stomach, damaging them and raising stomach pH



Haemonchus

- Historically, a tropical worm
- Becoming more common in Northern Plains

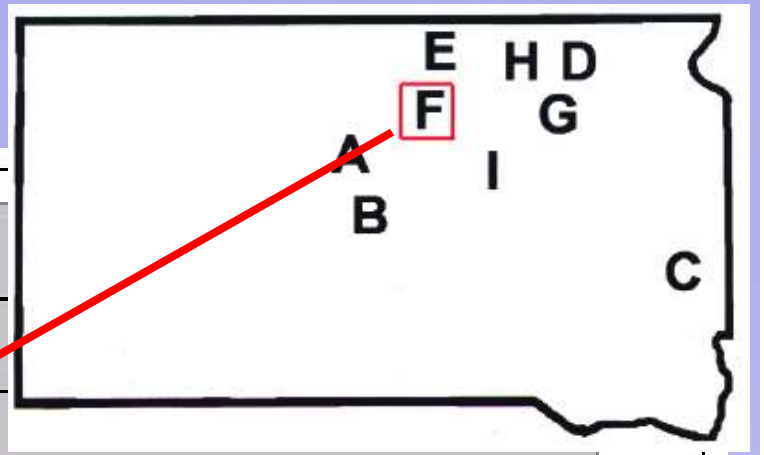
<u>In Sheep</u> - *Haemonchus contortus*

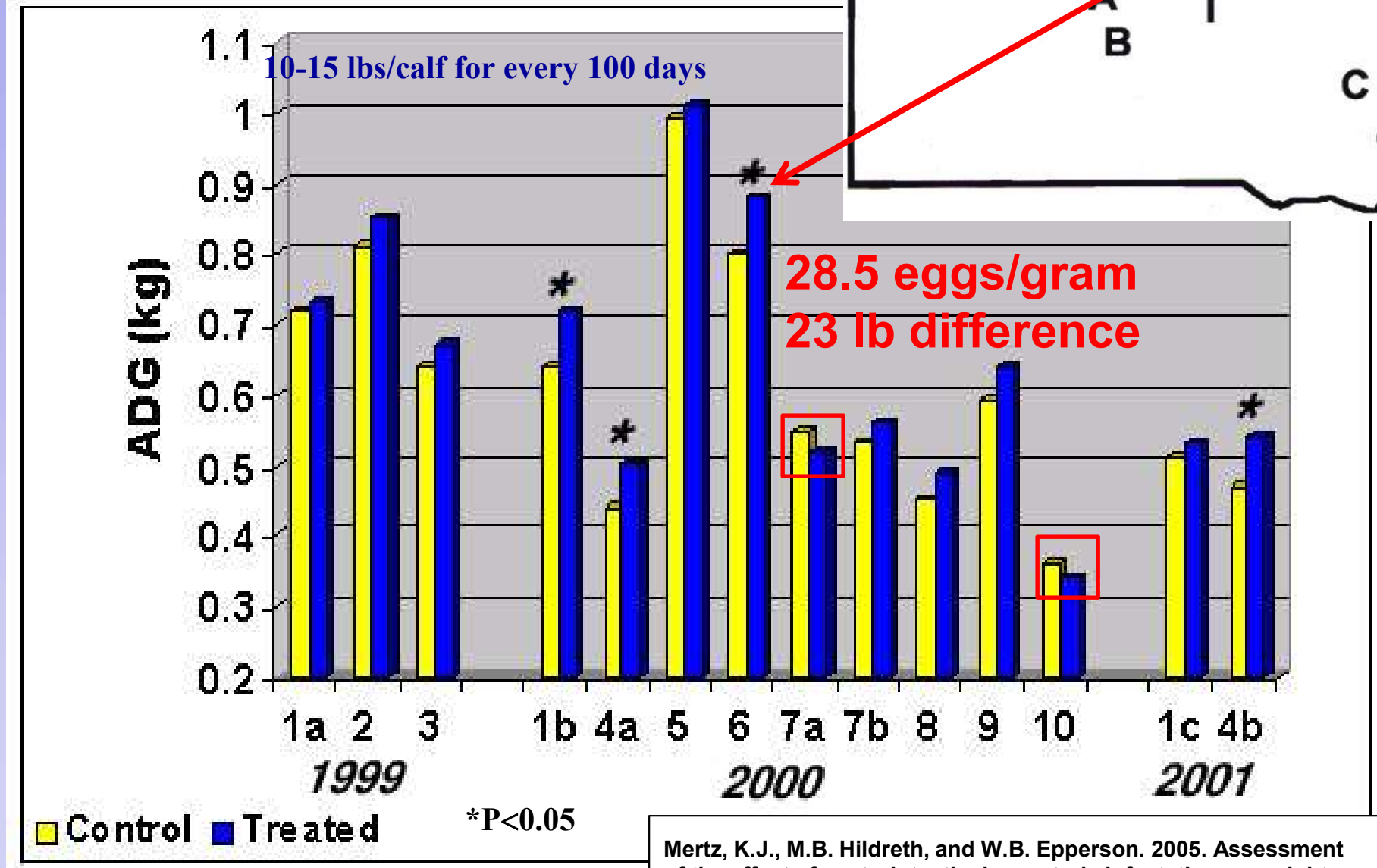
- Can cause lethal anemia
- Often resistant to anthelmintics

<u>In Cattle</u> – *H. placei* & *H. contortus*

- Doesn't seem to be as lethal, but
- Affects weight
- *H. contortus* often resistant

Results of Trials from 1999-2001

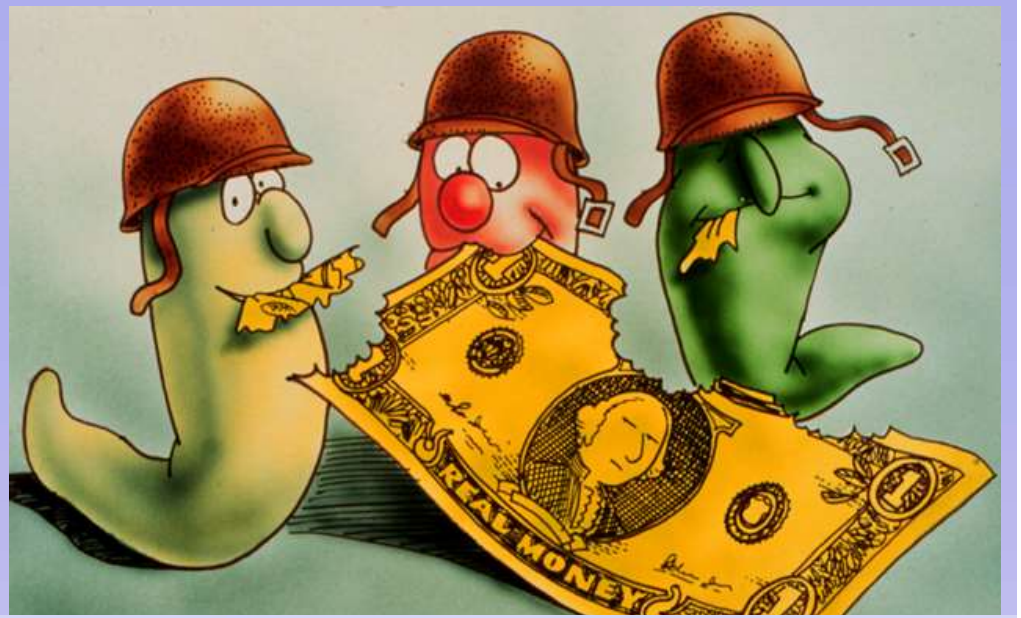




Mertz, K.J., M.B. Hildreth, and W.B. Epperson. 2005. Assessment of the effect of gastrointestinal nematode infestation on weight gain in grazing beef cattle. JAVMA: 226(5)779-783

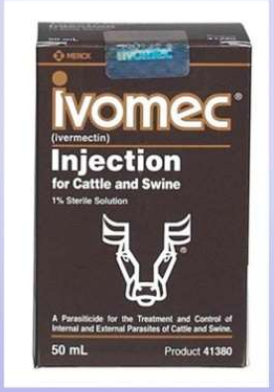
- Worms in stocker cattle cost South Dakota producers ~ 10-15 pounds per calf every 100 days on pasture
- Even with low egg output (≤ 35 EPG)
- Other effects of worms
  - Conception rates
  - Carcass quality
  - Immunity

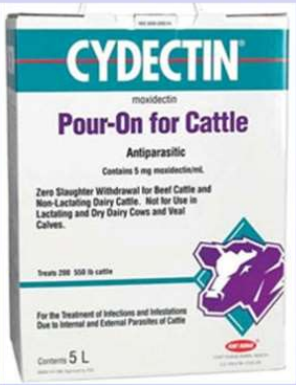
Most years it's worth the costs to treat and prevent these losses IF cattle can be protected during the key time period!

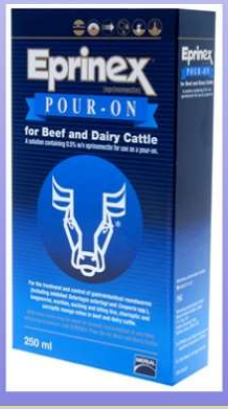


Cattle Dewormer Persistence

1 day → 30 days → 120 days



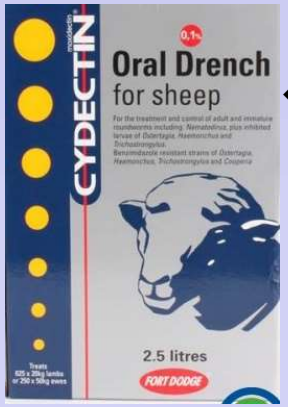




❖ **Imidazothiazoles Class**
- **Levamisole**
  Older anthelmintic that was discontinued for a while

❖ **Benzimidizole Class**
- **Albendazole**
- **Oxbendazole**
- **Fenbendazole**

❖ **Macrocyclic Lactone Class**
- ➢ **Milbemycin Subclass**
  - **Moxidectin**



❖ **Macrocyclic Lactone Class**
- ➢ **Avermectin Subclass**
  - **Ivermectin**
  - **Doramectin**
  - **Eprinomectin**

Accepted Manuscript

Anthelminthic Resistance Study 2007-10

Title: Overwintering Strategies of a Population of Anthelmintic-resistant *Haemonchus contortus* within a Sheep Flock from the United States Northern Great Plains

Authors: D.D. Grosz, A.A. Eljaki, L.D. Holler, D.J. Petersen, S.W.Holler, M.B. Hildreth

Drug [N]	Collection Dates	Mean Eggs/Gram (Stand. Deviation)	Percent Reduction (Confidence Interval)[b]
Doramectin [23 lambs]	preT: 7/2/07	1419 (918)	69% (44-83%)
	postT: 7/30/07	444 (215)	
Albendazole [29 lambs]	preT: 10/13/09	1092 (906)	90% (81-95%)
	postT: 10/23/09	106 (172)	
Moxidectin [27 ewes]	preT: 10/12/10	317 (322)	100%

TRIPLE TREATMENT METHODS

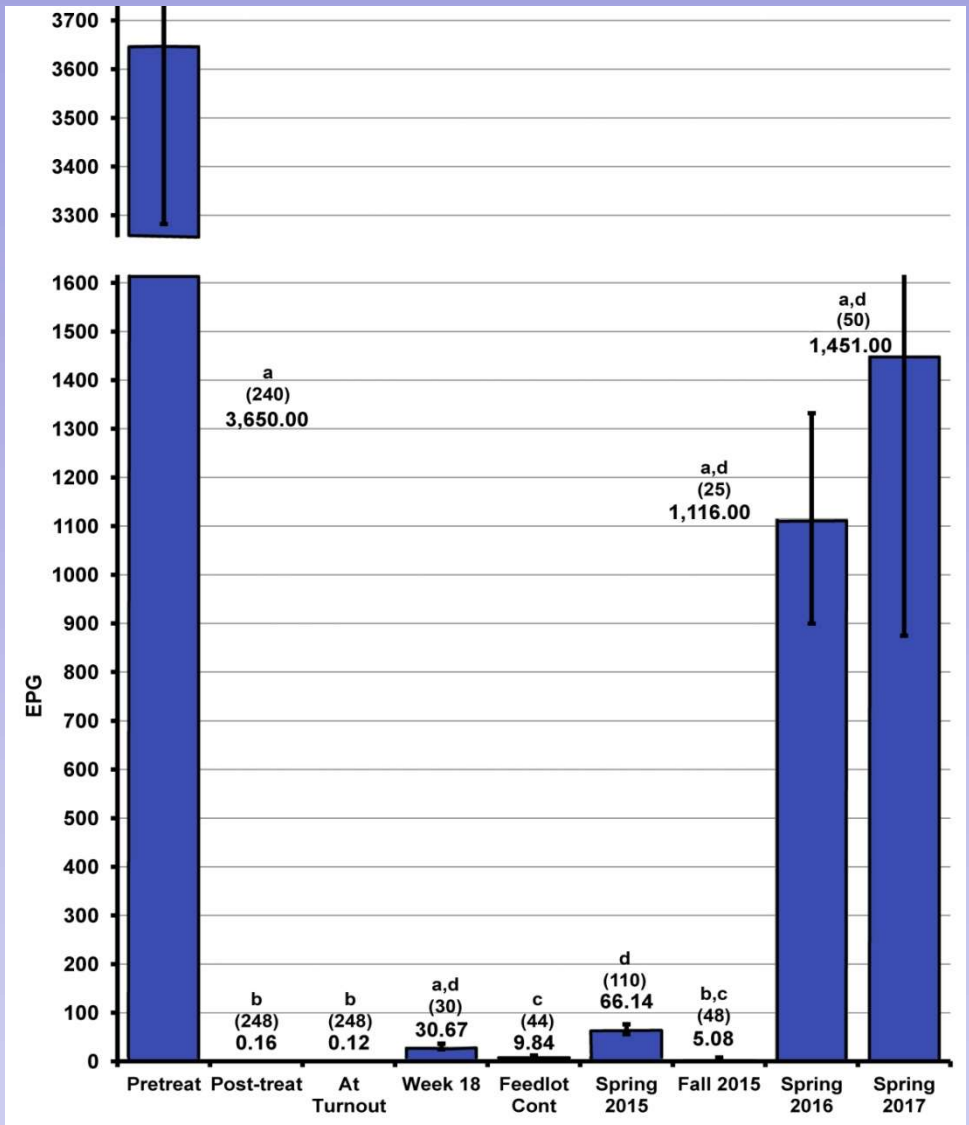
- **Animals**
  - Commercial 250 ewe flock in east-central South Dakota
  - History of *H. contortus* problems
  - Rotationally grazed ewes through 116 acre pasture divided into 8 paddocks.
- **Anthelmintics**
  - Starting in April 2014, 3 different anthelmintics were given orally:
    - moxidectin (Cydectin®; dosage of 0.2mg/kg),
    - albendzole (Valbazen®; dosage of 7.5mg/kg),
    - levamisole (Prohibit®; dosage of 7.5mg/kg).
  - Ewes were treated a 2nd time if FECs were greater than 1.
  - All ewes were treated again in spring of 2015 with levamisole
- **Fecal Egg Counts (FECs)**
  - Pre-treatment (N=250)
  - Post-treatment (N=250; after at least 9 days)
  - Only ewes with FECs less than 1 EPG went onto the pastures.
  - Pasture samples picked up every-other week (N=30)
  - Following Years during spring and fall (N=30)
- **Grazing Rotation**
- Prior to August 10, rotated through first 4 paddocks (17.62 ha) before retuning to a paddock; 3 total rotations through these.
- Other 3 paddocks were grazed only once, later in the season.

- **Rotational grazing can provide relief depending on the rotational scheme**
- **Successfully being used in an flock of 400 ewes infected with anthelmintic-resistant *Haemonchus***
- **Timing is a critical factor; the longer the period between returning to a plot, the better.**

Table 1. Rotational grazing time-table for 2014

Pad. No.	Area Hectares	1st Rotation		Days *	Weeks After**	2nd Rotation		Days *	Weeks After**	3rd Rotation		Days *	Weeks After**
		Begin	End			Begin	End			Begin	End		
1	4.56	6/30	7/7	7	1	8/10	8/18	8	7	10/15	10/23	8	16
2	1.36	7/7	7/10	3	2	8/18	8/21	3	8	10/10	10/15	5	15
3	3.63	7/10	7/17	7	3	8/21	8/26	5	8	10/23	10/28	5	17
4	8.07	7/17	8/1	15	4&5	9/2	9/11	9	10-11	10/28	11/4	5	18
5	5.8	8/1	8/10	9	6	9/29	10/10	8	14				
6	8.88	8/26	9/2	7	9								
7	5.06	9/11	9/19	8	11-12								

Fecal Egg Counts from Ewes Treated with 3 Classes of Anthelmintics



- mean pre-treatment FEC was 3606.8 EPG), ranging from 0 to 49400 EPG.
- The first triple treatment showed a 99.99% FEC reduction to 0.16 EPG
- 68% of the post-treatment samples showed no eggs; 27.6% contained less than 1 EPG, and 4.4% contained between 1 and 2 EPG.
- FEC at turnout was 0.12 eggs per gram
- Ewes with more than 1 EPG were kept in a feedlot
- After 18 weeks rotating through the different paddocks, FEC was already 30.7 EPG
- Next Spring, egg counts were still pretty low
- Spring of 2016 and 2017, FEC was about one/third of the original because of culling and rotations

PARASITE MANAGEMENT

- **Parasite Treatment (Fall Deworming)**
  - ⇔Targets 10% of the Parasite Population
  - ⇔Doesn't require product with persistence
  - ⇔Avermectins also control lice, especially as pour-ons
- **Parasite Management/Prevention (Strategic or Spring Deworming)**
  - ⇔Targets 90% of Parasite Population
  - ⇔Requires persistence or multiple treatments