Sheep Herd Health and Reproduction

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Sheep production
Sheep Industry Problems

• US decrease in sheep population
• Imports of wool, boxed lamb, carcasses
• Animal Welfare
• Grazing Issues
• Predator losses and Predator control
• Labor, reliance on foreign shepherds
• Lack of current research on production and health
• Land availability
Common Production Goals

• 1000 lbs of lamb/ewe lifetime
• 200 lbs of lamb/ewe annually
• 12 lbs of wool/ewe annually

Constraints

Less than 3% open ewes
Less than 4% culled ewes
Less than 5% lamb mortality
“the more capable managers are those who minimize the disadvantages while exploiting the inherent advantages of sheep production”
Sheep Industry Solutions

- Increase 2 Ewes/100 by 2014 = 175K ewes and 254K lambs for harvest. +2 million pounds of wool
- Increase birth rate to 2 lambs/year = 6.73 million lambs on the ground (compared to 3.6M in 2010)
- Increase harvested lamb crop by 2% = increase of 67,500 head through the system
- Reduce death loss due to predator, disease and mortality by increased quality of management
Get them pregnant
keep them pregnant
Don’t let the offspring die
Make them grow healthy and tasty!
Managing for Reproductive Efficiency
## Breeds of Sheep

<table>
<thead>
<tr>
<th>Breed</th>
<th>Early</th>
<th>Intermediate</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rambouillet</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merino</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorset</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suffolk</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Targhee</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Corriedale</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Southdown</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cheviot</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Scottish Blackface</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Long Wool</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Seasonal Breeding
Sheep reproduction facts

17 days cycles
20-36 H heat
5 month pregnancy
Short day breeders
• Shear
• Cull – BCS, molar wear, lameness, mastitis

• BCS
• Epididymitis
• Feet/legs
• Cull

• BCS / Nutrition
• Shade
• Metabolic Dz
• Parasite control
• Vit E – Se

• Pneumonia
• Coccidiosis
• Parasites
• Nutrition
• Enterotoxemia
• Predation
• Misadventure
• Fly Strike

• Abortion
• Prolapse
• Dystocia

• Neonatal mortality
• Genetic defects
• Navel ill
• Enteritis

• Mastitis
  Maternal bond
  Orphans/grafting
Reproductive Index = Lambing Rate

200 EWES
90% PREGNACY RATE
1.6 LAMBS PER EWE
200 x 0.9 x 1.6 = 288 LAMBS

REPRODUCTIVE INDEX = 288 / 200 = 1.44

Lambs born/Ewe exposed
Ram Effect

- Introduction of Ram to Anovulatory Ewes Induces Silent Estrus
- Synchronizing Effect
- Induces Breeding Season 2-3 Weeks Early
- Shortens Time to Puberty in Ewe Lambs
Ram Power – How Many?

- Ram Lambs – 1:20 ewes (5%)
- Yearling Rams – 1:25 to 1:30 (4%)
- Mature Rams – 1:40 (2.5%)
- New Zealand Range – 1:80-100 (1-1.25%)
Ram Calendar

Selection And Fitting

• When – 2 Months before Breeding
• Criteria
  o BCS 3.5-4.0 by turn-in date
  o Feet/Legs/Entropion/etc.
  o Satisfactory BSE
Ram Calendar

Selection And Fitting

• Processing
  o Shear for Testicular Cooling
  o Feeding for Target BCS
  o Housing – Provide Shade
  o Treatment if necessary, eg Pizzle Rot
  o Trim feets
  o Cull and Replace as necessary

Corynebacterium renale
Ram BCS

• Rams lose 10-12% body weight

• Requires approx. 1 month to add 1 BCS

• Body Condition Affects Libido
Breeding soundness examination of the ram

Scrotal Circumference

Palpation of testicles and Epididymis
# Breeding Soundness Exam

## Minimum Satisfactory Score

<table>
<thead>
<tr>
<th>Scrotal Circumference</th>
<th>Motility</th>
<th>Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-14mo &gt;30cm</td>
<td>Greater than 30%</td>
<td>Greater than 70%</td>
</tr>
<tr>
<td>&gt;14mo &gt;32cm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monitoring Ram Performance

- Each Ram Wears Marking Harness
- Chalk Colors Changed q 2 weeks
- Ewes can be Grouped
- Ram Performance Assessed
Heat Stress

• Ram
  o Decreased Motility
  o Decreased Morphology
  o Decreased Viability
  o Increased Embryonic Mortality

□ Ewe
  – Increased Embryonic Mortality
  – Reduced Placental Size
    □ Smaller Fetuses
    □ Less Milk Production
Shade
Flushing of Ewes

• High Energy Ration for 2 weeks prior to breeding increased lamb crop by 20%
• Possibly higher fertilization rate
• Slightly lower embryonic survival rate
• Increasing Energy by ~ 1lb grain/day
  o Supplement or High Quality Pasture
Breeding Management

• Control of the estrus cycle:
  o Ram effect (Induce estrus, synch)
  o Pgf2a (synch)
  o Progestins (Induce estrus, synch)
  o Seasonal manipulation (Light, melatonin)
  o Increasing twinning
CIDRs or sponges

- Most commonly used in purebred breeding
- Estrous cycle is controlled for either synchronized or stratified breeding
- Can be used with PG-600 at CIDR removal for improved twinning rate
Alternative Breeding Systems

• Artificial Insemination
  o Vaginal insemination
  o Cervical insemination
  o Trans-cervical insemination
  o Laparoscopic insemination
Alternative Breeding Systems

- Embryo transfer
- In vitro fertilization
- Cloning
- Frozen semen
- Chilled semen
# Ultrasonic Diagnosis of Pregnancy

<table>
<thead>
<tr>
<th>DAYS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-25</td>
<td>Trans rectal, embryo visible after day 24</td>
</tr>
<tr>
<td>26-35</td>
<td>Transabdominal; hypoechoic amnion and hyperechoic fetus</td>
</tr>
<tr>
<td>30-75</td>
<td>Transabdominal, doughnut and c-shaped placentomes</td>
</tr>
<tr>
<td>45-90</td>
<td>Best time for count</td>
</tr>
<tr>
<td>90-term</td>
<td>Determination of No. of fetus is less accurate</td>
</tr>
</tbody>
</table>
Keep them pregnant
Disease of the periparturient ewe

- Acidosis
- Trauma
- Hypocalcemia
- Hypomagnesaemia
- Hydrops/rupture of prepubic tendon
- Pregnancy ketosis
Disease of the periparturient ewe

- Ringwomb and early dilatation syndrome
- Prolapse of the vagina
Summary of Ovine Abortions
C.A. Kirkbride JVDI (1784 cases, 1980-1989)

- No diagnosis
- Protozoal
  - Toxoplasma
- Bacterial
  - Campylobacter
  - Chlamydia
  - Arcanobacterium
  - Salmonella
  - Pasteurella
- Viral
- Other
- No diagnosis with lesions
Abortion in Sheep
Diagnosis and control

• History:
  o No. of animals
  o Animal movements
  o Stage of gestation, group affected
  o Vaccination, nutritional and environmental exposure
Zoonotic Abortifacients

- Salmonella
- Listeriosis
- Leptospirosis
- Q Fever
- Toxoplasmosis

Wild, domestic animals, birds, vectors

Contaminated feed and bedding

Orphan lambs

Carrier sheep

Abortion material

Boots/clothing of farm workers
Samples to send

- First choice: placentas and fetuses
- Section of placenta: cotyledon and intercotyledonary membranes
- Thoracic and abdominal Fetal fluid
- Fetal stomach content (aseptic)
- Fresh spleen
Steps to be taken after abortion

- Isolate the ewe
- Dispose abortion products and bedding
- Disinfect pen/area
- Initiate antibiotic therapy
- Do not foster lambs in aborted ewes
Don’t let the offspring die
Obstetrics

• Cleanliness, Lubrication, Gentleness
  • If necessary, can pull with 1 front leg back

• Fetotomy – rare
  • Use cow Frick speculum to protect vagina from wire

• C-Sections – rarely needed
  • Ringwomb – cull? ; abdominal wall ruptures

• Special Observation of Ewe Lambs

• Episiotomy in Ewe Lambs
  • 2” at 2 O’clock – close by 1st intension
Oral Fluid Therapy
for Undifferentiated Diarrhea

- Assumptions – Physiologic Changes
  - Dehydrated
  - Base Deficit
  - Potassium losses
Water Losses

• Water
  o 400 kg Cow x 10% = 40 liters
  o 40 kg Calf x 10% = 4 liters
  o 4 kg Lamb x 10% = 0.4 liters
    o Note that dehydration <8% is not detected clinically
    o Dehydration >12% results in death
CD&T Vaccine + TAT

Add 2500 IU TAT to 50 cc CD&T for total cost of 45 cents/dose

$2.29 per 1500 IU

$6.99 for 25 doses
Coccidiosis

- Eimeria spp
- Common cause of diarrhea
  - 3+ weeks of age
- Fecal Oral Transmission
  - Contaminated lambing area
  - Fresh oocytes shed by ewes
  - Fresh oocytes shed by other lambs
- Crowded conditions
  - Intensive grazing, feedlot
- Incubation period 14-18 days
- Species specific
<table>
<thead>
<tr>
<th>Drug</th>
<th>Treatment</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfamethazine (Sulmet®)</td>
<td>140 mg/kg orally for 3 days</td>
<td>Daily dose 25 mg/kg for 1 week</td>
</tr>
<tr>
<td>Amprolium (Corid®)</td>
<td>10 mg/kg for 5 days</td>
<td>In feed 5 mg/kg for 21 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Polio concern”</td>
</tr>
<tr>
<td>Monensin (Rumensin®)</td>
<td>2 mg/kg for 20 days</td>
<td>20 mg/kg feed continuously</td>
</tr>
<tr>
<td>Lasalocid (Bovatec®)</td>
<td></td>
<td>25-100 mg/kg feed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weaning to market</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ewes: 2 wks before – 60d after lambing</td>
</tr>
<tr>
<td>Decoquinate (Deccox®)</td>
<td>0.5 mg/kg for 28 d</td>
<td></td>
</tr>
<tr>
<td>Sulfadimethoxine (Albon®)</td>
<td>55 mg/kg 1st day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>27 mg/kg days 2 - 5</td>
<td></td>
</tr>
</tbody>
</table>
Acute Respiratory Viruses

• Parainfluenza Type 3
  • Related to cattle and human PI3 but distinct
  • >70% of sheep are seropositive
  • Protection with intranasal ML vaccine??

• Adenovirus
  • Seroprevalence 7-80%
  • Can be associated with mild disease

• Respiratory Syncytial Virus
  • > 50% prevalence (42% of Bighorn sheep)
  • Mild disease unless complicated by M. haemolytica Type A
Copper Toxicity in Sheep
Prophylaxis/Metaphylaxis

- Creep feed with tetracycline crumbles
Gastrointestinal Disease

• Diarrhea
  o Bacteria
    • Colibacilosis
    • Enterotoxemia
    • Salmonella
  o Parasitic
    • Coccidia
    • Cryptosporidia
  o Viral
    • Rotavirus
  o Nutritional
    • milk replacers
    • high producing ewes
## Copper Tolerance

<table>
<thead>
<tr>
<th>Animal</th>
<th>Requirement (ppm)</th>
<th>Toxic Level (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swine</td>
<td>5-6</td>
<td>&gt;250</td>
</tr>
<tr>
<td>Poultry</td>
<td>6-8</td>
<td>250-800</td>
</tr>
<tr>
<td>Horses</td>
<td>9</td>
<td>&gt;250</td>
</tr>
<tr>
<td>Dairy Cow</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Beef Cow</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Sheep</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Goat</td>
<td>10</td>
<td>&gt;&gt;25</td>
</tr>
</tbody>
</table>

High Zn, Fe, Mo, SO4 inhibit uptake.
Clinical signs of Hemolytic Crisis/Copper

- Plasma Cu levels increase 10-20 fold (500-2000 mg/dl)
- Anorexia, weakness
- Depression
- +/- diarrhea
- Excessive thirst
- Icterus, hemoglobinemia, hemoglobinuria
- Death within 1-2 days
Postmortem findings

Copper

- Yellow fat/mucous membranes
- Hemoglobinemia
- Hemoglobinuria
- “Gun metal blue” kidneys
- Yellow, friable liver
  - Liver levels may reach 1000-3000 ppm dry wt
- Measure liver and kidney levels
Contagious Footrot of Sheep
Losses

Contagious Footrot of Sheep

- Labor
- Medicine
- Production
  - Ewe weight loss
  - Lowered milk production
    - Lighter lambs
  - Lowered conception
Treatment

Contagious Footrot of Sheep

• Trim all feet, abx wrap if necessary
  o Every foot of every sheep
  o Bacteria live at the leading edge, between healthy and infected tissue
• Systemic abx helpful
  o Penicillin, tetracycline
• Foot bath weekly 2-4 times
• Topical Kopertox
• Move keepers (healthy sheep) to new pasture
• Segregate chronics and continue treatment or cull
• Vaccination?
Anthelmintic Programs for Sheep
Overview

• Parasites are normal...disease is abnormal
• Few approved parasiticides for sheep
• Misuse is common
• Need to develop farm specific programs
  • Effective
  • Minimize resistance
• Farm specific programs
  • Single dewormer
  • Used strategically to reduce anemia/ egg count
  • Culling for parasite control: 80:20 rule
Internal Parasites

- Dyctiocaulus viviparus
- Muellerius capilaris
- Trichostrongylus
- Haemonchus contortus
- Ostertagia ostertagi
- Oesophagostomum
- Nematodirus
- Cooperia
- Dicrocoelium dendriticum
- Trichuris ovis
- Fasciola hepatica
- Trichostrongylus
Fecal egg counts

- Direct relationship between level of infection by adult worms and egg count
- Aid in deciding when to tactically treat
- Determine efficacy of anthelmintics on each individual farm
- Evaluate management schemes
FAMACHA®

Haemonchus contortus
Benzimidazoles

Small Ruminant Anthelminics

- Albendazole, fenbendazole
- Mechanism – Parasiticidal – Disrupts energy metabolism
  - Starves parasites by inhibiting mitochondrial enzymes
- Resistance is widespread
- Wide safety margin
Cholinergic Agonists

Small Ruminant Anthelminics

• Levamisole, morantel
• Mechanism – Parasitistatic – neurotoxic
  o Paralyze adults, expel them alive.
  o May cause transient excitability
  o No effect on eggs
Macrocytic Lactones/Avermectins

- Ivermectin, moxidectin, doramectin, eprinomectrin
- Mechanism – Parasiticidal – neurotoxic
  o Not effective against flukes or tapeworms
- Safe during pregnancy
- Narrower margin of safety
Parasite Resistance

- Reduction of < 60% of eggs
- Counts at day 0 and day 7-14 post treatment
- Farm-specific problem

**TABLE 1.** Main helminth species of livestock for which drug resistance has been reported

<table>
<thead>
<tr>
<th>Host</th>
<th>Parasite</th>
<th>Resistance to*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BZ</td>
</tr>
<tr>
<td>Sheep and goats</td>
<td><em>Haemonchus contortus</em></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td><em>Ostertagia</em> spp.</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td><em>Trichostrongylus</em> spp.</td>
<td>+</td>
</tr>
<tr>
<td>Horses</td>
<td><em>Cyathostomes</em></td>
<td>+</td>
</tr>
</tbody>
</table>

* BZ, benzimidazoles; LEV-MOR, levamisole-morantel; AVM-MIL, avermectins-milbemycins.

Source: Geerts and Gryseels, 2000, *Clin Microbiol Rev* 13, 207-222
Pasture Rotation

Avoiding Resistance

• Short duration pasture rest will result in high quality palatable forage
• Short duration pasture rest will result in greater exposure to nematode larvae
• In humid tropics 30 days pasture rest sufficient to kill off most larvae
• In cool moist areas 8 months is required for larval death which is too long for any advantage of pasture quality
Questions?