Artificial Insemination of Small Ruminants

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OVERVIEW
• Animal Management
• Female Reproductive Anatomy & Physiology
• Estrus manipulation
• Animal selection
• Frozen Semen handling
• Non-surgical artificial insemination

OBJECTIVES
• Understand basic anatomy and heat cycles of small ruminants
• Understand the importance of synchronizing heat/ovulation
• Learn how to evaluate stage of estrus
• Understand basic techniques/approach to non-surgical AI
• Learn proper handling of frozen semen
• Be able to decide which animals are appropriate to use for AI

FEMALE ANATOMY & PHYSIOLOGY
• Bicornuate uterus
• Ovaries that have multiple follicles or CLs during breeding season

P.L. Singer Pathways to Pregnancy and Parturition, 3rd Ed 2012
**FEMALE ANATOMY & PHYSIOLOGY**

- Annular rings in cervix
- Sheep cervix: cervical rings offset, difficult to inseminate through cervix

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**FEMALE ANATOMY & PHYSIOLOGY**

- Estrous Cycle: 20-21 days
  - Estrus = heat
  - Follicles on ovary secrete estrogen
  - Estrogen
  - Heat lasts 24-36 hours
- Estrus detection
  - Buck rag
  - Visual inspection: vulvar swelling, discharge
  - Behavior: increased bleating, urination, obvious restlessness, tail flagging, increased curiosity and attentiveness to the herdsman

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FEMALE ANATOMY & PHYSIOLOGY

**Estrous Cycle:** 20-21 days

- **Diestrus** = not in heat
  - Corpus Luteum (CL) on ovary
  - **Progesterone** – the hormone of pregnancy
  - ~ 2 weeks

- **Not pregnant** = come back into heat
  - If no pregnancy established, the uterus secretes **Prostaglandin F2a (PGF2a)**
  - PGF2a lyses the CL, progesterone decreases, and follicles begin to mature
  - Doe goes back into heat as follicles secrete estrogen

Estrus Synchronization

- Why?
  - Tight kidding/lambing season
  - Timed breeding

- How?
  - Buck effect
  - Photoperiod
  - Hormones
• CIDR: Controlled Intravaginal Drug Release
• A progesterone-secreting device
• CIDR treatment for 14 days followed by PGF2a (Lutalyse)
• Removal of the CIDR and administration of Lutalyse will mimic the normal return to heat
• Does will be in heat ~48 hours

ARTIFICIAL INSEMINATION

• What is the benefit?
  • Pros: access to more genetics, reduce inbreeding, reduce spread of disease
  • Cons: Cost, labor, lower pregnancy rates
    • Cost: AI equipment, nitrogen tank, labor and drugs for heat detection/sync,
• Who should be AI’d?
  • Young, healthy animals with good BCS and FAMACHA score
  • Vaccinated animals
  • Animals that have been in the herd 6-8 months, no mixing/introducing new stock
  • NO stress, gentle handling several weeks prior and after AI – do NOT enroll “crazies” in your AI breeding program
  • AI is NOT a procedure to get problem animals bred- if your buck/ram can’t do it, AI is NOT going to help

TOOLS + EQUIPMENT

• Semen handling:
  • Liquid nitrogen tank
  • Water bath
  • Thermometer
  • Scissors or straw cutter
  • Clean paper towels
  • AI gun
  • Sterile sheaths

TOOLS + EQUIPMENT

• Doe handling
  • Milking or fitting stand/other restraint
  • Clean vaginal speculums
  • Sterile, sperm-safe lube
  • Light source
FROZEN SEMEN

- Frozen semen:
  - Can be stored indefinitely
  - Sperm cells sustain damage during the freezing process
  - Sperm can survive 6-12 hours after being thawed
  - 180 million motile sperm recommended dose for TCI
  - Usually 1 straw per breeding
  - Sperm quality variable

- Semen storage:
  - Liquid nitrogen tank
  - "Dry shipper"
  - ~-200°C

- Photos courtesy of AAEP and EVE 2008

FROZEN SEMEN HANDLING

- Do NOT handle semen above the frost line
- Thermal damage can happen if straws are exposed
- Thermal damage is permanent - cannot be reversed by returning the straws to LN

- Photos courtesy of AAEP and EVE 2008

FROZEN SEMEN HANDLING

- Handle the semen within the tank, below the frost line
- Pull up the correct canister, identify the cane where your semen straws are
- Use tweezers to pull your semen straw out
- Immediately place your frozen straw in 35°C water bath to thaw

- Photos courtesy of Dairy Herd magazine, 2019

FROZEN SEMEN HANDLING

- Thawing semen:
  - Follow instructions provided from the stud
  - Water bath at 35°C (95°F) – MEASURE IT
  - QUICKLY transfer straws from tank into water bath
  - Thaw time variable - currently recommend minimum 30-60 seconds

- Photos caption: Place straw in 95°F (35°C) water to thaw for at least 45 seconds. Thaw no more straws than can be used in 15 minutes.
FROZEN SEMEN HANDLING

Loading straws:
- DRY straws with a clean paper towel - remember water is TOXIC
- Cut the sealed end of the straw - leave the cotton plug - flick the air bubble to the side you’re going to cut
- The cotton plug is what pushes the semen into the doe
- Warm the AI gun
- Load straw onto AI gun; place clean sheath over the gun + straw

ARTIFICIAL INSEMINATION: DOE HANDLING

- Site of semen deposition
  - Vaginal
  - Cervical
  - Intrauterine – laparoscopic, transcervical

ARTIFICIAL INSEMINATION

- When is the right time to breed?
  - Ovulation
  - How do you know?
  - How long does the egg last?
  - How long does the sperm last?
- Expected conception rates
  - Fresh semen: 60%
  - Chilled shipped semen: 50-60%
  - Frozen semen: 15-50%
- Proper breeding management and timing is essential

INSEMINATION TECHNIQUES

• Visualize the cervix – evaluate color and mucus quality
• Direct your AI gun to the cervix
• Use moderate pressure and rotation to guide the AI gun through the rings of the cervix - you will feel a pop or see forward progress as you pass through
• SLOWLY deposit semen into the uterus - press plunger over 5-7 seconds

NOW WHAT?

• Re-breeding?
  • Fresh insemination
  • Chilled shipped insemination
  • Frozen semen
• Record keeping
• Stress management
• Pregnancy evaluations
  • Return to estrus
  • Ultrasound
  • Blood testing

GET READY FOR KIDDING & LAMBING SEASON!