Artificial Insemination of Small Ruminants

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Sheep & Goat Symposium 2023

OVERVIEW

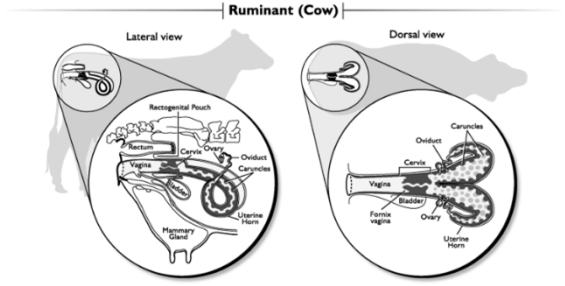
- Animal Management
- Female Reproductive Anatomy & Physiology
- Estrus manipulation
- Animal selection
- Frozen Semen handling
- Non-surgical artificial insemination

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

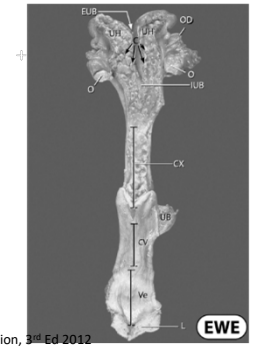
- Bicornuate uterus
- Ovaries that have multiple follicles or CLs during breeding season



P.L. Senger Pathways to Pregnancy and Parturition, 3rd Ed 2012

FEMALE ANATOMY & PHYSIOLOGY

- Annular rings in cervix
- Sheep cervix- cervical rings offset, <u>difficult to inseminate through cervix</u>



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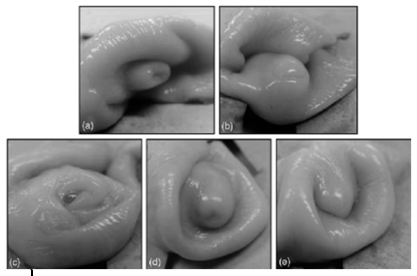
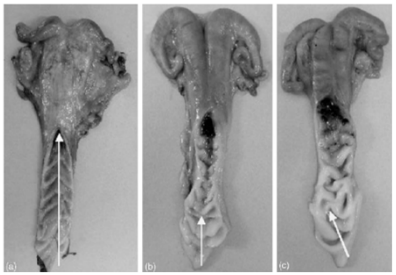
FEMALE ANATOMY & PHYSIOLOGY





Kershaw, et al. "The Anatomy of the Sheep Cervix and its Influence on the Transcervical Passage of an Inseminating Pipette into the Uterine Lumen" Theriogenology 2005

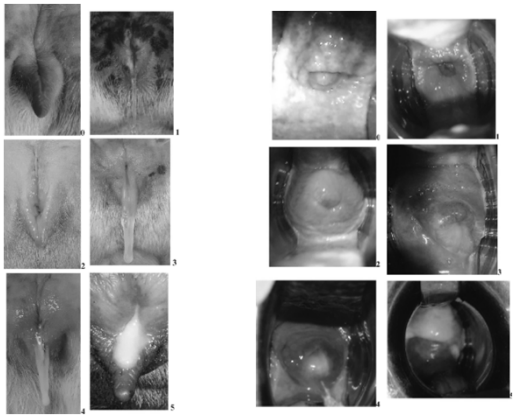
FEMALE ANATOMY & PHYSIOLOGY

Puberty	6-8 months Wait to breed until 60% adult weight
Season	Normal breeding season: Oct – Dec Some breeds: August- March Seasonally Polyestrous
Estrous Cycle	Goats: 20-21 days Sheep: 16 days

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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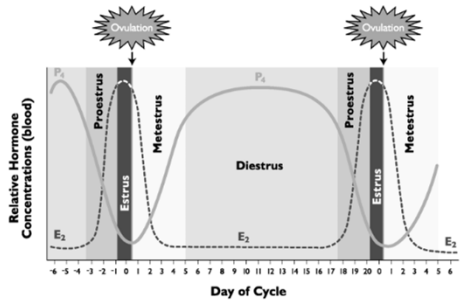
FEMALE ANATOMY & PHYSIOLOGY

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

FEMALE ANATOMY & PHYSIOLOGY



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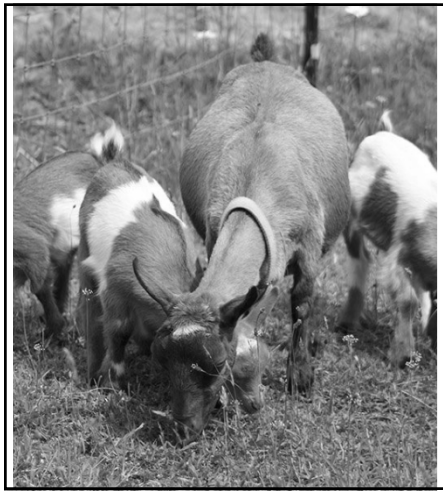
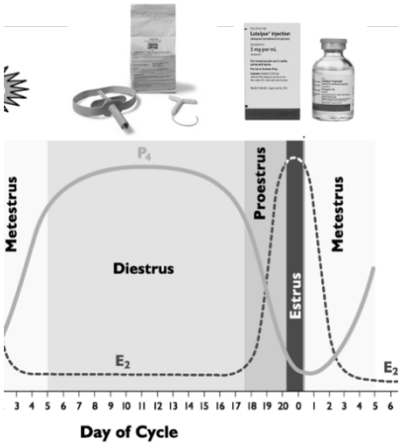


ESTRUS SYNCHRONIZATION

- 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

13

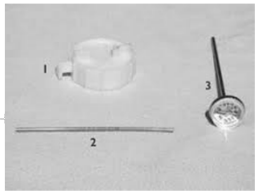
ARTIFICIAL INSEMINATION

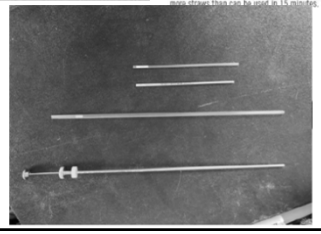
- What is the benefit?
  - Pros: access to more genetics, reduce inbreeding, reduce spread of disease
  - Cons: Cost, labor, lower pregnancy rates
    - Cost: AI equipment, nitrogen tank, labor and drugs for heat detection/sync,
- Who should be AI'd?
  - Young, healthy animals with good BCS and FAMACHA 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

14

TOOLS + EQUIPMENT

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





15

TOOLS + EQUIPMENT

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

16

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"
  - ~-200C

Fig 1: Organisational hierarchy for storage of semen in a semen tank. From left to right: straw, goblet, cane and canister.

Photos courtesy of AAEP and EVE 2008

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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 be returning the straws to LN

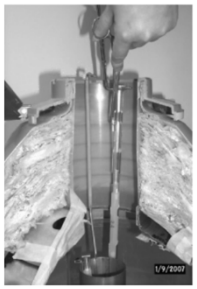


Fig 2: Cut open section of a long-term semen storage tank demonstrating how to hold a cane while removing a straw from a goblet on the cane (left).

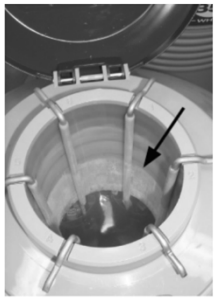


Fig 3: During handling, semen straws should remain below the frost line (arrow) to prevent premature thawing of semen.

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 35C water bath to thaw

Dairy Herd magazine, 2019

FROZEN SEMEN HANDLING

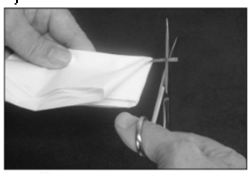
- Thawing semen
  - Follow instructions provided from the stud
  - Water bath at 35C (95F) – MEASURE IT
  - QUICKLY transfer straws from tank into water bath
  - Thaw time variable- currently recommend minimum 30-60 seconds

Place straws in 95° F (35° C) water to thaw for at least 45 seconds. Thaw no more straws than can be used in 15 minutes.

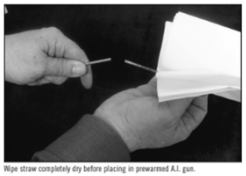
FROZEN SEMEN HANDLING

Loading straws:

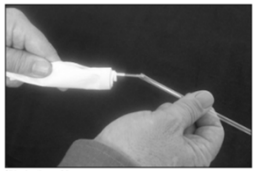
- DRY straws with a clean paper towel- remember water is TOXIC
- Cut the sealed end of the straw- leave the cotton plug- flick the air bubble to the side you're going to cut
- The cotton plug is what pushes the semen into the doe
- Warm the AI gun
- Load straw onto AI gun; place clean sheath over the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



Cut straws ¼" below lab seal at 90° angle.



Wipe straw completely dry before placing in prewarmed A.I. gun.

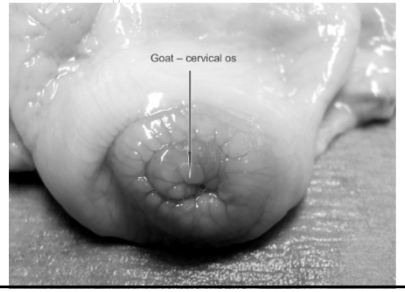


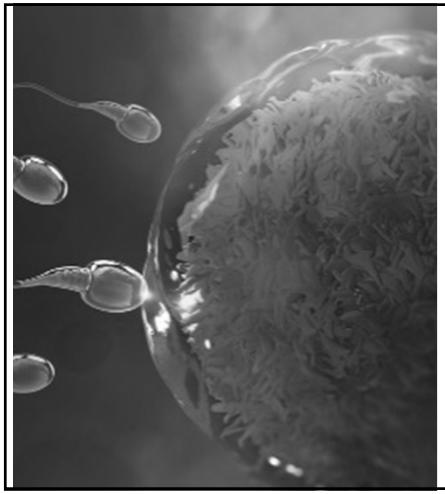
Slide sheath over A.I. gun.

Photos courtesy of Select Sires publications

ARTIFICIAL INSEMINATION: DOE HANDLING

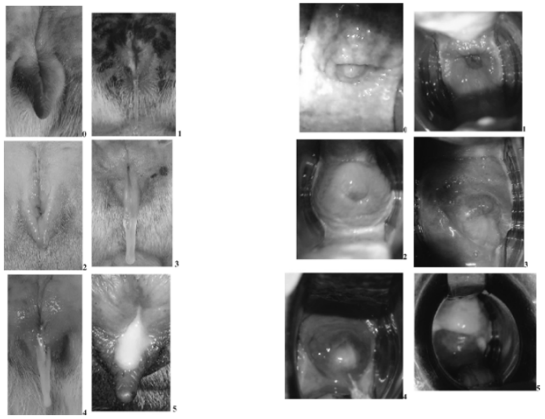
- Site of semen deposition
  - Vaginal
  - Cervical
  - Intrauterine – laparoscopic, transcervical





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 <u>essential</u>



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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

25

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!

27