Advanced Reproduction for Small Ruminants

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Outline

- Definitions
- Overview of Reproductive Characteristics
- Breeding Management
- Pregnancy Diagnosis

Definitions

Corpus luteum (CL) = structure on the ovary responsible for secreting progesterone during anestrus and pregnancy in the female

eCG/hCG = equine(e) or human(h) chorionic gonadotropin hormone is used to synchronize estrus and ovulation in the female

Estrous cycle = reproductive cycle (cyclical pattern of female ovarian activity)

Estrus = heat; signals ovulation in the female

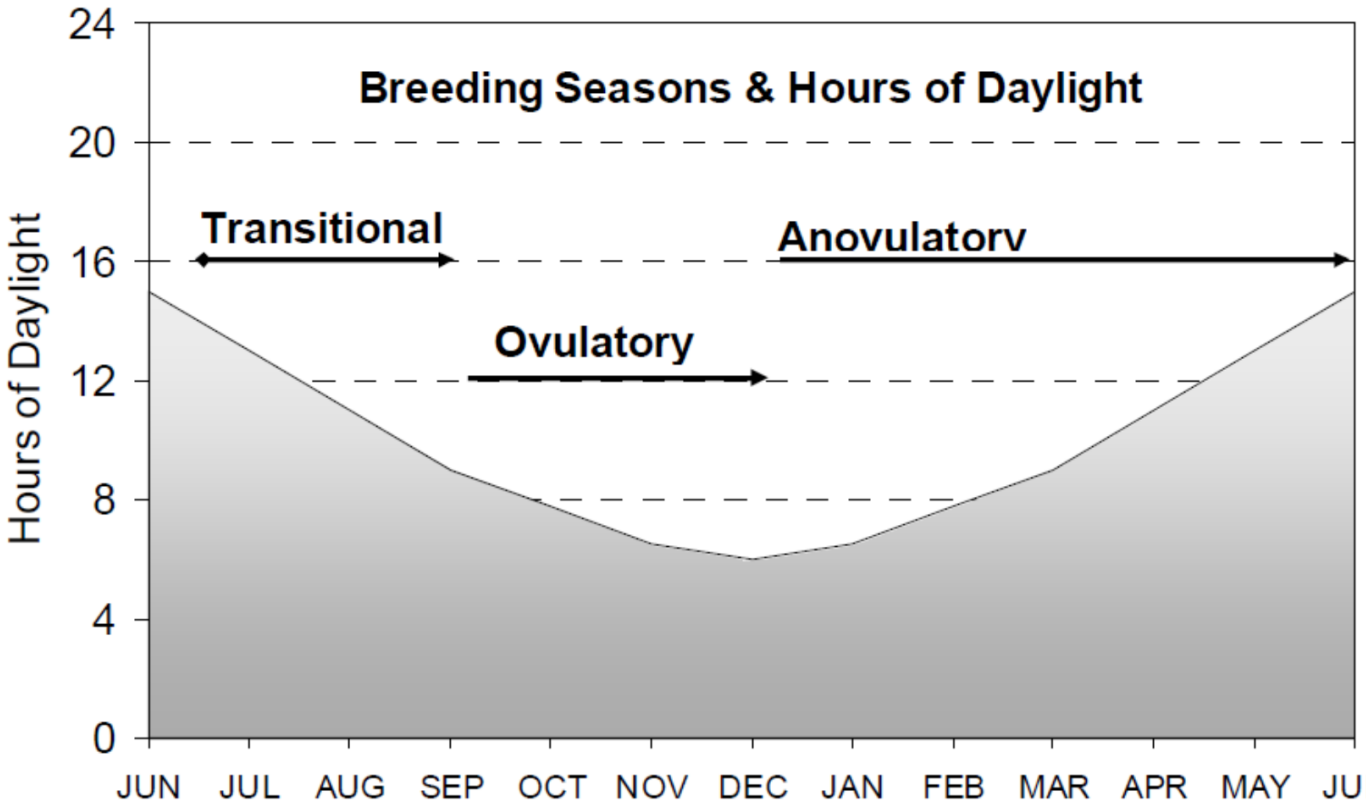
Ovulation = phase of the estrous cycle where the female ovary releases an egg (ovum) and awaits fertilization by sperm

Progesterone (P4) = steroid hormone secreted by the ovarian corpus luteum during pregnancy (or anestrus)

Reproductive Characteristics of Small Ruminants

	SHEEP	GOATS
Age to Puberty (breed variation exists)	Rams: 6 months Ewes: 5-7 months	Bucks: 6 months Doe: 5-7 months Pygmy goats: 2-3 months
Age at first breeding (recommendation)	6-8 months (60-70% of mature bodyweight)	6-8 months (60-70% of mature bodyweight)
Length of estrous cycle	17 days	21 days
Duration of estrus	24-36 hours	12-36 hours
Time of ovulation (Optimal breeding time)	24-30 hours from onset of estrus (towards the end of estrus)	30-36 hours from onset of estrus (at acceptance of buck (~24h) and again in 12 hours)

Small Ruminants are Short Day Breeders



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Breeding Management

- Manipulation of the estrous cycle
  - Goals for your operation determine which approach you may take
  1) Induction of estrus during transition or anovulatory season
     - Goal: Additional pregnancies generated out of season (i.e., 3 pregnancies in 2 years)
  2) Synchronization of estrus and ovulation during ovulatory season
     - Goal: Unified lambing/kidding season (i.e., homogenous lamb/kid crop at weaning)
  3) Increase the prolificacy
     - Goal: Generate multiples (i.e., more twin or triplet pregnancies)

Breeding Management

- Induction of estrus during transition or anovulatory season
  - Methods:
    - Progesterone (P4) intravaginal insert
      - Controlled internal drug release (CIDR) devices
      - Mimics the function of the corpus luteum (CL)

    - Male (ram/buck) effect
      - After at least 6 weeks of isolation from the male(s), introduction of a male stimulates non-cycling females to ovulate
      - Silent estrus (heat) in 3-4 days after introduction of the male
      - Next estrus (heat) is normal

Breeding Management

- Synchronization of estrus and ovulation during ovulatory season
  - Methods:
    - Many different synchronization protocols exist
      - May utilize CIDR, PG600 (eCG and hCG), prostaglandin, artificial insemination or natural mating
    - Work with your veterinarian to find a protocol that fits your operation and its needs/goals

Breeding Management

- Increase the prolificacy
  - Methods:
    - Superovulation via eCG (or hCG)
      - Embryo flushing (surgical procedure in small ruminants)
    - 'Flushing'
      - Practice of providing extra nutrition (usually energy) to ewes/does prior to and during the early part of the breeding season
      - Increases weight gain and body condition in ewes/does which may result in the birth of additional offspring (twins and triplets)

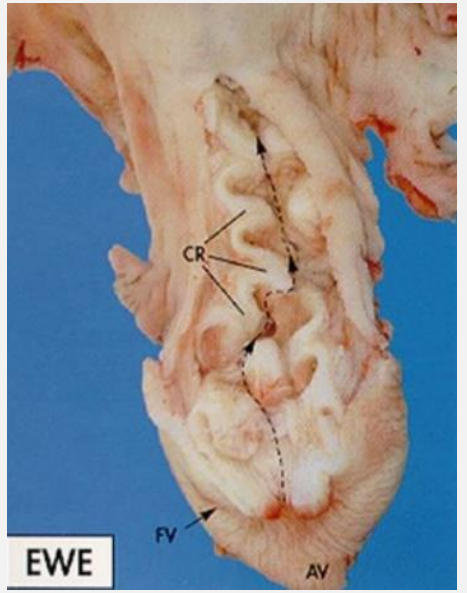
Breeding Methods

- Natural breeding
  - **Ram and ewes**
    - Minimum of 27 days together (1.5 estrous cycle)
    - Recommended ram/ewe ratio: 3-5 rams / 100 ewes
  - **Buck and does**
    - Minimum of 32 days together (1.5 estrous cycle)
    - Recommended buck/doe ratio: 3 bucks / 100 does

Ewe/Doe Cervical Anatomy

- Cervical rings
  - Ewe: 7 rings (tortuous)
  - Doe: 5 rings (aligned)

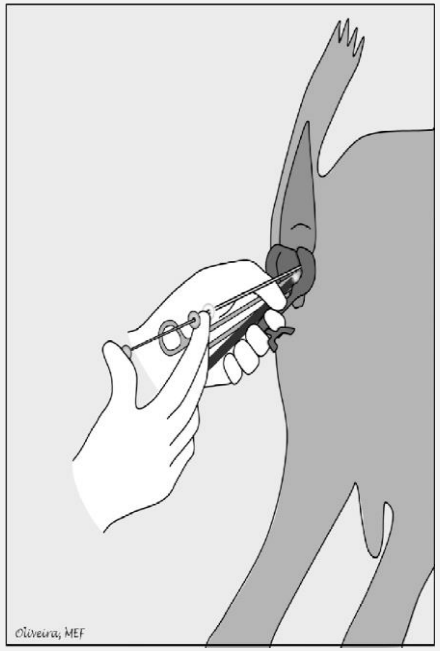
- Differences contribute to artificial insemination technique
  - Ewe: laparoscopic artificial insemination (lap AI)
  - Doe: trans-cervical or lap AI



Breeding Methods

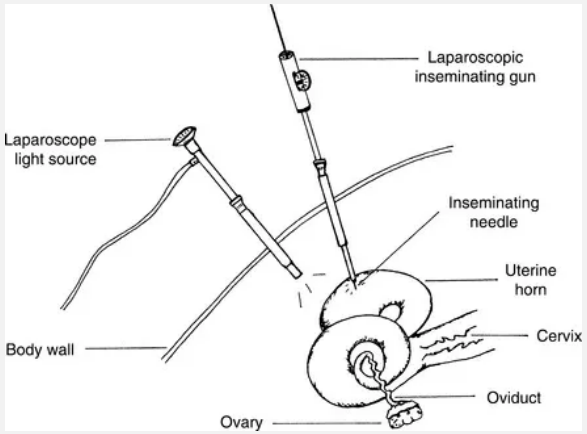
Transcervical Artificial Insemination

- Recommended in does only



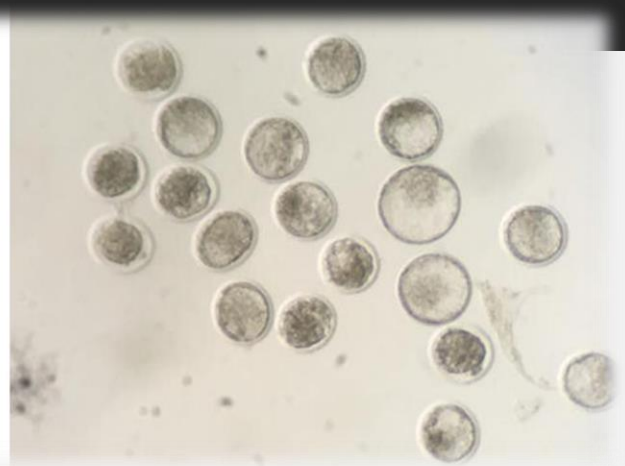
Laparoscopic Artificial Insemination

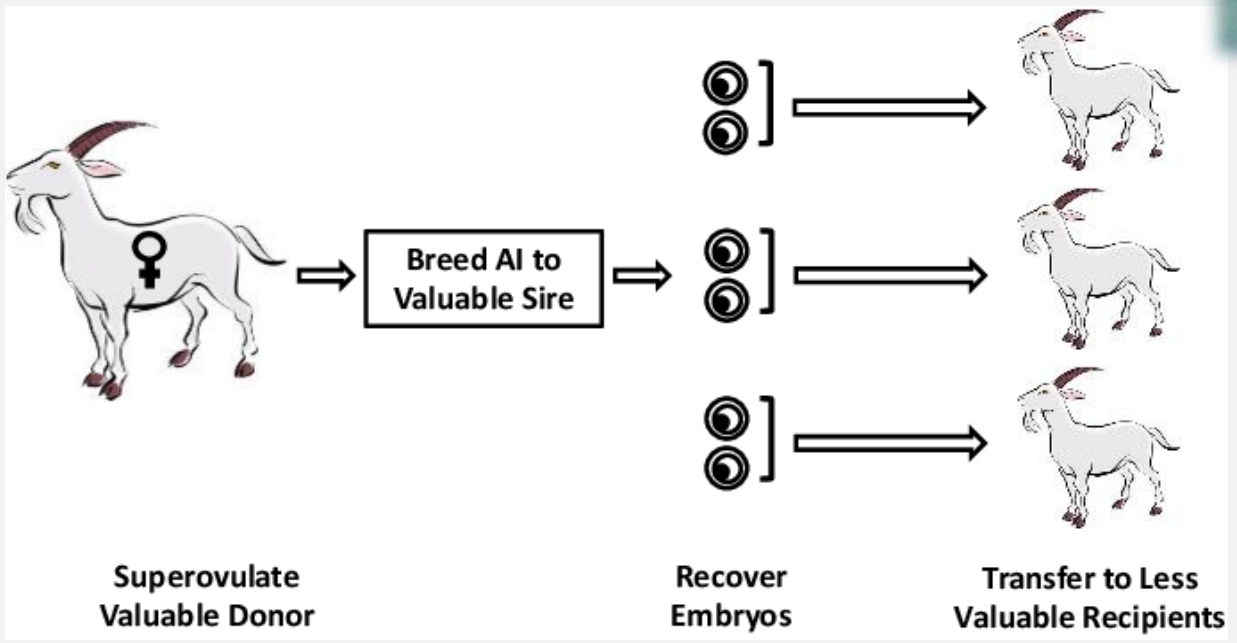
- Ewes and does

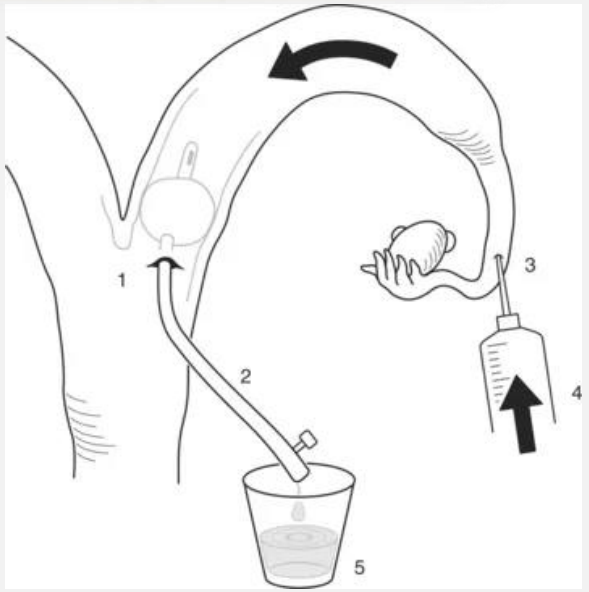


Breeding Methods

- Surgical Embryo Flushing
  - Ewes and does



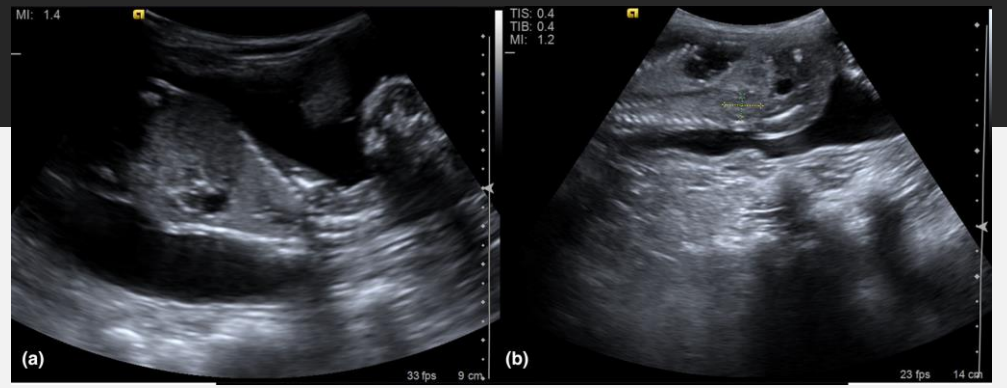




Pregnancy Diagnosis

- **Indirect** pregnancy test
  - No return to estrus
    - Ewe = 17 days
    - Doe = 21 days
  - Progesterone measurements (>1ng/mL)
  - BioPRYN®
    - Measures pregnancy specific protein B (PSPB) which are produced by the ruminant placenta
    - Use at > 30d gestation

Pregnancy Diagnosis



- **Direct** pregnancy test
  - Ultrasonography (transabdominal)
    - Early pregnancy diagnosis (as early as 28-30d gestation)
      - Diagnose fetal heartbeat
      - Possible to count fetuses (optimal time is 40-70d gestation)
  - Radiography
    - Bone ossification needs to be present
      - Possible at >58d gestation
      - Optimal at >90d gestation

Summary

- Small ruminants are short day breeders
- There are protocols that allow for out-of-season breeding in small ruminants
- There are methods to synchronize estrus in small ruminants
- Small ruminants can be bred using natural methods or artificial insemination
- Ultrasound is the most common and accurate method of pregnancy diagnosis in small ruminants

Thank you!

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