Artificial Insemination (AI) in Cattle

- Most dairy cows are bred by AI
- Less common in beef cattle
  - Commonly, bulls are used for all breeding under pasture conditions
  - Less commonly, bulls are used as ‘clean-up’ sires after AI on synchronized estrus
Advantages

- Genetic improvement
  - Use of proven sires
- Control of venereal diseases
- “Insurance policy” on valuable bulls
- Elimination of the expense and danger of using bulls
Important Traits

○ Dairy
  ● Milk production
  ● Percent protein
  ● Percent fat
  ● Type
  ● Calving ease, etc.

○ Beef
  ● Growth rate
  ● Carcass quality
  ● Show-ring results
  ● Calving ease, etc.
Semen Collection
Semen Dilution and Cryopreservation

- Only licensed AI Centers are allowed to package and sell frozen semen
- All bulls undergo rigorous health testing before their semen can be sold
- Some centers process bull semen for ‘owner’s use only’
Semen Extenders

- Heat-treated whole milk
- Egg yolk and citrate or tris

Antibiotics added to all extenders
Semen Processing
Semen Processing, continued
Estrous Detection

- Ideally observe animals for $\geq 30$ min $\geq 2X$ daily
- Most effective when animals are not being fed or disturbed
- However, estrous period in Holsteins $\sim 7$ hrs for cows and $\sim 11$ hrs for heifers vs. 8-14 hrs 30 years ago
Estrous Detection

**PROESTRUS**
- Stands & bellows
- Smells other cows
- May mount but will NOT stand.
- Mucous discharge.

**ESTRUS: 8 ~ 12 HRS**
- Cow in heat
  - STANDS for mounting.
  - Bellows. Off-feed.
  - Milk drops & cow is restless.

**METESTRUS**
- Cow smells others
  - Will NOT stand to be mounted.
Estrous Detection Aids

Too late:
Estrous Detection Aids

Heat expectancy charts
Estrous Detection Aids

KAMAR heat-mount detectors

Estrus Alert
Estrous Detection Aids

“Cow-side” ELISA tests for milk progesterone
Optimal Time to Inseminate

Breed when the cow or heifer is in standing estrus
Thawing Semen

20°C
THAWING DANGER
-196°C
Thawing Semen

- Minimize exposure to light and warmth
- Damage is cumulative
Thawing semen

- Thaw for ≥30 sec in a 35-37°C water bath
- Inseminate within 15 min of thawing
Insemination - Preparation
Insemination - Procedure
Questions?
Artificial Insemination in Sheep
Artificial Insemination in Sheep

- Promotes rapid genetic improvement
- Common in sheep-producing countries
- Estrus is usually synchronized
Artificial Insemination in Sheep

- Rams are trained and collected with an artificial vagina
- Semen is extended and used fresh
- Frozen-thawed semen is also used
Timing of Insemination

- **After estrous synchronization**
  - Once at 55 hrs after device removal or
  - Twice at 48 & 60 hrs after device removal
- **Without estrous synchronization**
  - 12-18 hrs after the onset of estrus
  - Teaser rams will be necessary to detect estrus
Insemination Technique

- The cervix cannot be threaded without using special equipment
Insemination Technique – Fresh Semen

- The cervix is visualized using a speculum and head lamp
- The semen is deposited as deep as possible into the cervix after withdrawing the speculum slightly
- 200-500 million motile sperm/dose
Insemination Technique – Frozen-thawed Semen

- Intrauterine insemination is required
- Laparoscopic insemination is most commonly used
- >20-50 million motile sperm/dose
Artificial Insemination in Goats
Artificial Insemination in Goats

- Similar principles as in sheep
- More demonstrative than ewes when in estrus but buck scent is often needed
- Inseminate once 12-24 hrs after the onset of estrus
- Better results with two inseminations at 12 and 24 hrs after estrus onset
Goat AI Supplies
Goat AI
By: Charles T. Estill, VMD, PhD, DACT

- Lift the doe's hindquarters
- Lubricate the speculum with a non-spermicidal lubricant.
- Clean the doe's vulva with a dry paper towel and insert the lubricated speculum slowly into the vulva.
- Visually locate the cervix.
  - cervix should have a red-purple color and white mucus will be present if the doe is in heat
Goat AI
By: Charles T. Estill, VMD, PhD, DACT

- Insert the insemination gun into the speculum and thread it into the opening of the cervix.
- Use a circular motion and slight pressure to work the insemination gun through the rings of the cervix.
- Do not penetrate the cervix more than 1.5 inches.
- Deposit the semen slowly by pushing the plunger forward.
Frozen-thawed Semen

- Usually does not require laparoscopic insemination as the cervix can be penetrated more deeply than in ewes
Questions?