North Carolina State University
Bovine Palpation Team

Topic 2: Artificial Insemination & Synchronization
WORLD of COW
By Stik

Well...from what I can remember, your father looked a bit like a giant turkey baster.
Outline

- Reproductive Anatomy and Physiology of Cattle
- AI Technique in Cattle – 1930’s
- Handling of Frozen Semen – 1950’s
- Heat detection and Timing of Insemination – 1970’s
- Sexed Semen – 1980’s
Reproductive Anatomy and Physiology of Cattle
Normal Position

- What lies below the reproductive tract?
Normal Position

- What lies below the reproductive tract?
  - Bladder
Natural vs. Artificial Insemination

- Where is semen deposited during natural breeding?
- During AI?
Natural vs. Artificial Insemination

- Where is semen deposited during natural breeding?
  - Anterior portion of vagina

- During AI?
  - Uterine body
Uterine contraction under the influence of Oxytocin aid in sperm transport.
The end result

Third Years – Position?
A.1 Technique In Cattle
Right-handed vs. Left-handed?

What structure displaces the tract to the right?
Right-handed vs. Left-handed?

What structure displaces the tract to the right?

Rumen
PLACE CERVIX ONTO GUN!!!
Slowly dispense semen into UTERINE BODY over a few seconds.
Proper Insemination Technique
Improper Insemination Technique
Handling of Frozen Semen Straws
What do you know already?

- What is semen stored in?
- Temperature?
- How many sperm are in a .5ml straw?
- What temp is semen thawed at?
- How long?
- What kills semen?
Semen storage:
- .5 ml or .25 ml straws
- 5 or more straws per goblet
- 2 goblets per metal cane
- Canes stored in canisters
- 1 or more canisters per tank

.5 ml straw = 15–20 million sperm

Each semen cane is identified with the bull’s code number printed on top.
Liquid Nitrogen Tanks
-320 degrees F
Insemination Equipment

- Forceps
- Thermos w/ thermometer
- Scissors
- Straw gun
- Disposable sheaths
- Split vs. non-split
- “0” ring (if needed)
- Paper towels
- Sleeves

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Place straw in 95 degree F water bath for 45 seconds.
Wipe straw completely before placing it in your pre-warmed AI gun.
Cut ¼ in below crimped end of the straw at a 90 degree angle.
Proper Seal
Now what do you know?

- What is semen stored in?
- Temperature?
- How many semen are in a .5ml straw?
- What temp is semen thawed at?
- How long?
- What kills semen?
Now what do you know?

- What is semen stored in?
  - Liquid Nitrogen

- Temperature?
  - –320 F

- How many sperm are in a .5ml straw?
  - 15–20 million

- What temp is semen thawed at?
  - 98 F

- How long?
  - 45 seconds

- What kills semen?
  - water, cold, blood, etc…
Heat Detection and Timing of Insemination
Secondary signs of heat include?
Let's review...

Secondary sighs of heat include?

- SAG’s
- Mounting (which one is in heat?)
- Head laying

Frequent urination
- Vulvar mucous discharge
- Roughed tail head
- Dirty flanks
What clinical changes would you expect during...

- **Estrus:**
  - Hormones?
  - Uterus?
  - Ovaries?
  - Behavior?
What clinical changes would you expect during...

**Estrus:**
- Hormones? E2
- Uterus? Toned
- Ovaries? Large follicles, old, small CL’s from previous cycles
- Behavior? Standing Heat
What clinical changes would you expect during...

- **Luteal Phase:**
  - Hormones?
  - Uterus?
  - Ovaries?
What clinical changes would you expect during...

- **Luteal Phase:**
  - **Hormones?** P4, low levels of E2 and Inhibin from follicular waves
  - **Uterus?** Early edematous and flaccid late
  - **Ovaries?** Early ovulation follicle depression, CL palpable by day 5, numerous small follicles that develop then regress
What clinical changes would you expect during...

- Follicular Phase:
  - Hormones?
  - Uterus?
  - Ovaries?
Follicular Phase:
- Hormones? Increasing levels of E2
- Uterus? Increasing tone
- Ovaries? CL rapidly regresses, concurrent increase in diameter of pre-ovulatory follicle
FOLLICULAR PHASE

- Day 0
- Day 1
- Day 4

LUTEAL PHASE

- Day 7
- Day 11
- Day 13
- Day 16
- Day 18
- Day 19
- Day 20

\[ P_4 \downarrow E_2 \uparrow \]

\[ P_4 \uparrow E_2 \downarrow \]
Estrus Synchronization
“Reproductive Management Tool”

- Maintain a short calving interval
- Induce synchronous cycling w/in herd
- Induction of fertile heat in anestrous cows
- Calves born earlier in calving season = increased weaning weights at sale
- Longer time for uterine involution
- Breed heifers before cows to allow for additional recovery time post-calving.
- Selection of low birth weight, calving ease bulls for heifers w/o the $ of bull on farm
Your turn…

- What time of the day do cows show heat most frequently?
- What is the AM/PM Rule?
Between midnight and 6am

Inseminate cows/heifers 10–14 hours after first standing heat. Seen in the evening then breed the next morning. Seen in the morning wait to breed that evening.

What time of the day do cows show heat most frequently?

What is the AM/PM Rule?
Drugs

GnRH

PGF

Melengesterol Acetate (P4)

P4
Heat Detection

Select Synch

```
| 0 | 4 | 7 | 13 |
```
treatment day
Heat detect & AI

Select Synch + CIDR®

```
| 0 | 7 | 13 |
```
treatment day
Heat detect & AI

MGA® Select

```
| 6 | 14 | 26 | 33 | 39 |
```
treatment day
Heat detect & AI
**Heat Detect & Time AI (TAI)**

**Select Synch & TAI**
Heat detect and AI day 4 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.

**Select Synch + CIDR® & TAI**
Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.

**MGA® Select & TAI**
Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.
**Fixed-time AI (TAI)**

**CO-Synch + CIDR®**
Perform TAI at 66 hr after PG with GnRH at TAI.

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**MGA® Select**
Perform TAI at 72 hr after PG with GnRH at TAI.

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These protocols are recommended by the North Central Region Bovine Reproduction Task Force.
**Heat Detection**

**1 Shot PG**

- Treatment day: -5 to 0
- Heat detect & AI: 0 to 6

**CIDR®-PG**

- Treatment day: 0 to 7
- Heat detect & AI: 7 to 13

**MGA®-PG**

- Treatment day: 0 to 14
- Heat detect & AI: 33 to 39
- Duration: ... 19 d ...
Beef Heifer Protocols cont...

**HEAT DETECT & TIME AI (TAI)**

**Select Synch + CIDR® & TAI**
Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.

**MGA®-PG & TAI**
Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hrs after PG with GnRH at TAI.
BEEF HEIFER PROTOCOLS CONT...

**FIXED-TIME AI (TAI)**

CO-Synch + CIDR®

Perform TAI at 54 hr after PG with GnRH at TAI.

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MGA®-PG

Perform TAI at 72 hr after PG with GnRH at TAI.

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Sexed Semen
How it’s done...

- Semen is stained with a fluorescent dye and sent through a flow-cytometer at 60 mph, under 40–60 psi of pressure.
- X- chromosome is larger than Y = more fluorescence.
- Slow process
- 30% sperm orientated correctly
- 15% of that 30% = Female = Marketable
- 10% chance of getting a male
Pros and Cons

- More expensive
- Experienced AI technician needed
- Best used in virgin heifers
- Increased chances of heifer calves from 50% to 90% (Dairy)
- Fast way to grow a herd size internally
- Increased biosecurity
- Heifer calves are generally smaller than bulls = calving ease
- Beef producers can select for bulls = steers = more money

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Questions?