Sexual Behavior (cont.)

B. Applied Reproductive Behavior of the Male: Semen Collection and Processing

Text: Ch. 10 and 11

Age When Semen Can Be Collected

<table>
<thead>
<tr>
<th>Animal</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull</td>
<td>12 months</td>
</tr>
<tr>
<td>Boar</td>
<td>6 - 8 months</td>
</tr>
<tr>
<td>Ram</td>
<td>6 - 9 months</td>
</tr>
<tr>
<td>Stallion</td>
<td>20 - 24 months</td>
</tr>
<tr>
<td>Dog</td>
<td>8 - 12 months</td>
</tr>
</tbody>
</table>

Effect of Age on Sperm Output

- Sexual arousal
  - Sight, sound, smell, touch
  - Best mount - Live

Collection on a Live Mount
Semen Collection

- Sexual arousal
  - Sight, sound, smell, touch
  - Best mount - Live
  - Alternative mount - dummies
    - Bull
    - Stallion
    - Boar
    - Ram

Collection of a Bull on a Dummy

Stallion Collection on a Phantom

Boar Collection on a Dummy

Ram Collection on a Dummy
Semen Collection (cont.)

• Sexual Preparation
  » False mounts
    • In bulls can increase sperm collected by 100%
  » Novelty
    • Change mounts, location, other males present
  » Breed and species differences
    • Beef bulls less libido than dairy bulls
    • Arab stallions more libido than Quarter horse stallions
    • Rams less libido than bulls or male goats

• Frequency of collection
  » As increase frequency/wk
  • decrease sperm/ejaculate
  • Increase sperm recovered/wk

Effect of Collection Frequency on Sperm Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Dairy</th>
<th>Beef</th>
<th>Sheep</th>
<th>Swine</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td># of collections</td>
<td>1-6</td>
<td>1-6</td>
<td>7-25</td>
<td>2-5</td>
<td>2-6</td>
</tr>
<tr>
<td>Volume (ml)</td>
<td>5-8</td>
<td>3-6</td>
<td>0.8-1.2</td>
<td>150-300</td>
<td>30-100</td>
</tr>
<tr>
<td>Concentration (million/ml)</td>
<td>1000-2000</td>
<td>800-1500</td>
<td>2000-3000</td>
<td>200-300</td>
<td>200-400</td>
</tr>
<tr>
<td>Total sperm/ejac. (billion)</td>
<td>7-15</td>
<td>5-10</td>
<td>1.6-3.6</td>
<td>30-60</td>
<td>5-10</td>
</tr>
<tr>
<td>Total sperm/wk (billion)</td>
<td>15-40</td>
<td>10-30</td>
<td>25-40</td>
<td>100-150</td>
<td>15-30</td>
</tr>
<tr>
<td>Motile sperm(%)</td>
<td>50-75</td>
<td>40-75</td>
<td>60-80</td>
<td>50-80</td>
<td>40-75</td>
</tr>
<tr>
<td>Normal sperm(%)</td>
<td>70-95</td>
<td>65-90</td>
<td>80-95</td>
<td>70-90</td>
<td>70-90</td>
</tr>
</tbody>
</table>

Artificial Vaginas

Characteristics of AV

• Temperature
  » Bull, stallion, ram - 45°C
• Pressure
• Friction
  » Lubrication essential

Electroejaculation

• Useful if male won’t or can’t mount
  » Get urine often
  » Poorer quality ejac.
• Used in rams and beef bulls
**Massage Method**

- Stimulate by rectal massage
  - Seminal vesicles
  - Vas deferens

**Semen Evaluation**

- Appearance (color)
  - No debris
  - No pus
  - No urine
- Volume
- Motility
- Concentration
  - Hemocytometer, spectrophotometer
- Morphology

**Preservation of Semen**

- Extenders (7 components)
  - Nutrients
    - Glucose, fructose
  - Cold shock prevention
    - Milk, skim-milk, egg yolk
  - Buffer
    - Citrate, Tris
  - Osmotic pressure
    - The buffer component

**Preservation of Semen (cont.)**

- Inhibit bacterial growth
  - Antibiotics
- Increase volume
- Cryoprotectant
  - Glycerol

**Preservation of Semen (cont.)**

- Liquid Semen
  - Collect semen
  - Semen quality exam
  - Extend 1:3 (semen:extender)
    - Minimal extension rate
  - Cool to 5°C over 2 hours
    - OK for bull, stallion, ram
    - Boar - cool to 15°C

- Once cooled, extend semen to final amount
  - Bovine (inseminate 0.5 ml)
    - 2 to 5 million sperm/ml
  - Equine (inseminate 1 billion sperm)
    - 25 to 50 million sperm/ml
    - If don’t cool then inseminate 500 million motile sperm
  - Swine (inseminate 1.5 to 6 billion sperm in 50 ml)
    - 30 to 120 million sperm/ml
**Preservation of Semen (cont.)**

- **Frozen semen**
  - Follow instruction for collecting and cooling semen
  - After cooling to 5°C, extend to 2X the final concentration desired
    - If want final concentration to be 40 million/ml then dilute to 80 million to ml at this time
  - Hold semen for 4 to 6 hours at 5°C
    - Equilibrates semen to the cold

- **Add the cryoprotectant**
  - Mix extender with 2X final cryoprotectant amount, 1:1 with extended semen
  - Do this in small portions to minimize cryoprotectant toxicity

- **Package semen**
  - 0.5 ml French straws
  - Ampules

- **Freeze semen**
  - Liquid nitrogen vapor
    - Static
    - Mechanically controlled
  - Dry ice depressions for pellet freezing

**Preservation of Semen (cont.)**

- **Storage**
  - In a liquid nitrogen tank

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**Liquid Nitrogen Tank**

**Temperature in Neck of Storage Tank**

![Diagram showing temperature distribution in a liquid nitrogen tank](image)
Thawing

- Use the procedures recommended by the semen supplier!!!
  - 35°C water for 30 - 60 seconds
  - Ice water for 3 minutes
  - Pocket thaw
- Have thawing container near LN tank when removing semen

Conclusions on LN Tank

- Maintain LN level as high as possible.
- Keep extra tank (narrow neck) with only nitrogen so semen storage tank can be refilled when opened.
- Enter semen storage tank only when needed
- Do not hold canes above neck of LN tank

Temperature of Straws If Low LN