Artificial insemination (AI)

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Definition

Artificial introduction of the semen into the female genitalia at the proper time of insemination

Simple artificial insemination protocol

Semen collection

Insemination

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What is the advantage that can be achieved by this simple protocol

1- It can overcome some problems that interfere with the natural mating
   - Lack or complete lose of sexual desire
   - Impotentia Quandi
   - Great difference in size

2- It can be helpful to overcome some venereal diseases

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Advanced artificial insemination protocol

Semen collection

X

Semen processing

X

Semen dilution

Semen preservation

X

Insemination

chilled semen

Frozen semen

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The learning objectives of this course

1- To understand the advantage that can be achieved by application of AI.

2- To understand the difficulties facing the application of the AI.

3- To be able to collect semen from different species.

4- To understand the biochemistry and the metabolism of semen sample.

5- To be able to evaluate semen sample.

6- To be able to dilutes and preserve the semen sample.

7- To be able to artificially inseminate female of different species.
Semen collection

Aims or indications

1- Application of artificial examination

2- Breeding soundness examination of the male
Methods of Semen collection

1- Collection of semen from vagina or the uterus

Idea: To allow the male to mount and complete mount the female then collect the semen from the female genital tract

- Spongy method
- Aspiration method

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Disadvantage

1- The semen sample is mixed with vaginal mucous
- Great chance for transmission of venereal disease
- Masking physical properties
- Difficult microscopic examination
- Diluted not representative sample

Minimizing the disadvantage

1- If possible use female out of estrus
2- Make vaginal douching before collection
3- Genital examination for female
4- Use special female for each male

2- Can not be used in bull that have no desire or no ability to mount and complete mounting of the female
2- Collection of semen using condom or breeding bag

Idea  Application of the condom over the fully erected penis before mounting

1- Condom

2- Mare

3- Stallion

4- Method of application

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3- Semen collection by artificial vagina (AV)

Idea

Exposure of the male animal to natural copulatory condition up to the seeking and intromission stage at which the penis is redirected into artificially prepared vagina supplied with optimum condition that can stimulate the ejaculation process.
Advantage

1- Clean and concentrated
2- Give good indication about the sexual desire, potency, spermatogenic activity of the testis
3- It require simple equipment

Disadvantage

1- Can not be used in bull that have no desire or no ability to mount and complete mounting of the female
2- It require special training for the bull
3- Some bull my not ejaculate properly in to AV
4- Possibility of injury to the operator

Requirements for collection of semen by AV

1- Artificial vagina
2- Male
3- Mount
4- Place

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1- Artificial vagina

Parts

1- Thick outer cylinder

2- Thin inner sleeve, inner rubber liner, latex inner liner

3- Rubber cone

4- Collecting graduated tube or bottle

5- Broad rubber band

6- Insulating jacket

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Sterilization and Assembling

Outer cylinder  Inner liner

Rubber band

Collecting tube

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Simulation of the artificial vagina to the natural vagina

1- Warming

Temperature inside the inner lining

<table>
<thead>
<tr>
<th>Animal</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull</td>
<td>42-45</td>
</tr>
<tr>
<td>Ram</td>
<td>41-44</td>
</tr>
<tr>
<td>Camel</td>
<td>41-43</td>
</tr>
<tr>
<td>Stallion</td>
<td>45-49</td>
</tr>
<tr>
<td>Dog</td>
<td>40-42</td>
</tr>
</tbody>
</table>

What is the draw back of improper adjusting of the temperature inside the AV?

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2- Lubrication

Lubricate the caudal 1/3 with non-spermicidal lubricant

What is the drawback of improper lubrication of the inner sleeve?

3- Pressure

Allow passage of one figure under pressure

What is the drawback of improper adjusting of the pressure inside the AV?

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2- Male

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3- Mount

4- Place

Female

Male

Dummy and operator

Movable dummy with fixed AV

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Preparation of the mare to be used as a mount

1- Induction of estrus symptom

2- Special care for restraining

3- Warping of the tail
Steps for semen collection by AV in bull

1- Preparation of the place, mount, bull and AV
2-Sexual stimulation of the bull
3- Actual collection

Bull cow 1   Bull cow 2   Bull-bull   Bull dummy

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Steps for semen collection by AV in ram and buck

Buck 1

Buck 2

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Semen collection by AV in stallion

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Steps for semen collection by AV in stallion

Stallion dummy

Stallion dummy built in AV

Stallion mare

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Semen collection by AV in camel

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Semen collection by AV in Boar
4- Collection of the semen by rectal massage to ampullae and seminal glands

Idea
Manual massage of the accessory gland of cow and buffalo bulls may result in dripping of the semen (mostly without erection)

Advantage
Can be used in bulls that
1- Have no desire or no ability to mount and complete mounting of the female
2- Not respond properly to the AV

Disadvantage
1- Semen sample is not clean
2- Semen sample is not concentrated
3- Possibility of urination
4- Require special experience
5- Not all bull can be response properly
Method

1- Preparation of the bull

2- Preparation of the operator

3- Semen collection

Rectal massage elephant
5- Collection of the semen by electro ejaculation

Idea
Rhythmic electrical stimulation of the nerve supply of the genital organ (posterior mesenteric plexus and anatomically related sympathetic and parasympathetic ganglia) results in ejaculation with erection in 90% percent of cases.

Advantage
Same as massage of ampullae and seminal glands

disadvantage
1- The sample have large volume and lower sp.c.c.
2- Some males may ejaculate without erection
3- Some males may lay down during collection
4- Some bulls may not react adequately

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Electroejaculator

Bull, Camel  
30-35X6-9.5 cm

Ram  
20 X 2 cm
Methods

Bull electroejaculation

1- Preparation of the bull

2- Semen collection

- Early stimulation
- Actual ejaculation

Low voltage 7 volt
- Partial erection
- Clear pineal secretion

Higher voltage 10-15 volt
- Cloudy or milky secretion
Ram electroejaculation

Ram electroejaculator lay down  Ram electroejaculator standing

boar electroejaculation

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6- Collection of dog semen by Digital manipulation penis

Dog digital manipulation

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7- Collection of the boar semen by gloved hand method

Boar gloved hand

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<table>
<thead>
<tr>
<th>Method</th>
<th>Bull</th>
<th>Ram</th>
<th>Stallion</th>
<th>Camel-bull</th>
<th>Dog</th>
<th>Boar</th>
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</thead>
<tbody>
<tr>
<td>Collection from vagina</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>X</td>
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<tr>
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<td>X</td>
</tr>
<tr>
<td>Gloved hand</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

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Schedule for semen collection from different animal

The schedule of semen collection must be designed to achieve maximum weekly sperm output without reducing the quality of the ejaculate.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull</td>
<td>3 times/week and 2 ejaculate/time</td>
</tr>
<tr>
<td>Stallion</td>
<td>Every other day</td>
</tr>
<tr>
<td>Ram</td>
<td>Every day with several ejaculate/day</td>
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</table>