Artificial Insemination in Cattle

Introduction

- This slide show is designed to introduce students to artificial insemination in cattle.

- However, it is only a brief overview and further training is necessary before performing artificial insemination.
Objectives

- Explain the benefits of artificial insemination.
- Briefly outline the procedure of artificial insemination.

What is Artificial Insemination?

- Artificial insemination (AI) is the placing of sperm in the reproductive tract of a female by means other than that of the natural breeding process.
Advantages of AI

- Producers are able to use superior bulls for breeding without the cost and responsibility of owning them.
- Improve economic traits: weaning weights, average daily gain, calving ease, carcass quality, and maternal ability.
- AI reduces the chance of passing diseases among cattle because mating does not occur and antibiotics are added to the semen used for insemination during the processing stage.

Advantages of AI (con’t.)

- AI allows many cows to be bred in one day, whereas a bull can only breed a few cows.
- Increase superior genetics.
Necessary Equipment for AI

- Artificial vagina
- Extender
- Straws

Necessary Equipment for AI (con’t.)

- Al Rod
- Gloves
- Straw cutter
Necessary Equipment for AI (con’t.)

- Collection vial
- Thaw bath
- Lutalyse
- Gloves
- Paper towels
- Teaser cow
- Sheath
- Lubricant
Semen Collection

- Semen used for AI can be collected by:
  - rectal massage
  - electroejaculation
  - artificial vagina

Semen Collection (con’t.)

- The most common method of collection is the artificial vagina as this results in the highest quantity and quality of semen.
Semen Collection (con’t.)

- The artificial vagina consists of a large rubber tube lined with a water holding jacket.
- A receptacle for collecting the semen is attached to the end of the tube.

Semen Collection (con’t.)

- Bulls are trained to mount a dummy or teaser female, while a technician guides the bull’s penis into the artificial vagina.
- As the bull ejaculates, the semen is collected in the receptacle at the opposite end of the artificial vagina.
Semen Evaluation

- After the semen has been collected, it is examined in the lab under a microscope for motility and morphology.

Motility and Morphology

- Motility is the activity of the sperm. Sperm must be able to travel directly to the egg for fertilization.

- Morphology refers to the shape of the sperm. Sperm cells must be shaped normally without any defects for fertilization to occur.
Semen Evaluation (con’t.)

- In addition to correct motility and morphology, sperm cells have to be in sufficient quantity in the semen sample.
- Sperm quantity is determined by a trained professional who is able to estimate the number of active sperm in a millimeter of semen.
- Semen must contain at least 40 million cells per cc before freezing and 12.5 million cells per cc after thawing to be used for AI.

Processing the Semen

- After the semen sample passes a thorough evaluation, it must be processed using an extender.
- The extender dilutes the semen sample so it can be divided into several units for the fertilization of many eggs.
- The extender also dilutes the waste products produced by the sperm so the sperm remains viable.
Processing the Semen (con’t.)

- Extender also provides nourishment and protects the semen after it has been frozen.
- Common extenders added to semen include milk, egg yolk, glycerine, and antibiotics.

After the extender has been added to the semen, it is checked again for motility.

- The semen is then placed into straws.
- Each straw contains enough semen to artificially inseminate a female once (one-half cc).
Freezing the Semen

- Semen is frozen at a constant rate until it reaches a temperature of –320 F.
- Semen is stored in liquid nitrogen tanks to preserve it.

Preparing to Inseminate

- The cow must be in estrus or heat before she is artificial inseminated.
- Estrus is the time period during the estrous cycle when the female will allow breeding to occur.
- Some signs that a cow is in estrus are riding other cows, restlessness, and pacing the fence.
- The cow should be inseminated 12 hours after the first signs of estrus.
Inducing Estrus

- Some producers use an artificial version of the natural hormone prostaglandin to induce estrus.
- 2 injections of Lutalyse 11 days apart will cause the cow to come into estrus regardless of her current stage in the estrous cycle.

Estrus Synchronization

- This technology is known as estrus synchronization and is useful in large groups of cows.
- Estrus synchronization provides advantages to producers because all cows can be inseminated at the same time and all should calve around the same time.
The Insemination Process

- The first step of the insemination process is to load the cow into a chute or other holding device.

Thawing the Semen

- Once the cow is in the chute, the technician should thaw the straw of semen.

- Thawing must be done carefully to avoid damage to the sperm.

- Thawing semen too fast or too slow will harm the sperm.
Thawing the Semen (con’t.)

- The straw must be carefully removed from the liquid nitrogen tank to avoid burn injuries from the liquid nitrogen.

Thawing the Semen (con’t.)

- The straw should then be placed in a warm water bath for 30 seconds.
- The straw is then removed from the bath and dried off with a paper towel to prevent water from coming into contact with the semen.
Loading the AI Rod

- Using a straw cutter, the end is cut off of the straw of semen.

Loading the AI Rod (con’t.)

- The straw is placed into the end of the AI rod and a protective sheath is put over the rod.
- The plunger is locked into place.
Transporting the AI Rod

- It is a good idea to wrap the end of the AI rod containing the straw of semen in a paper towel to protect the semen from temperature change and to avoid contamination.
- The rod should be carefully carried by the technician or an assistant to the site where the cow will be inseminated.

Locating the Cervix

- The technician should insert one hand into the cow’s rectum to locate the reproductive tract and cervix.
Cleaning the Vulva

- The skin around the vagina (the vulva) should be cleaned with paper towels to avoid contaminating the cow when inserting the AI rod into the vagina.

Inserting the Rod

- Once the cervix has been located, the AI rod is inserted through the vagina into the reproductive tract.

- The rod must be passed through the three muscular rings of the cervix and into the body of the uterus.
Depositing the Semen

- Once the technician is sure the rod has passed through all three rings of the cervix, the semen is deposited into the body of the uterus.

Removing the Rod

- After the semen has been deposited, the rod should carefully be removed from the reproductive tract.
Massaging the Tract

- The technician may also massage the tract to ensure the semen reaches both uterine horns.

- The technician cannot be sure if the female will ovulate from the left or right ovary, so massaging the tract ensures that the semen reaches both uterine horns.

Massaging the Tract (con’t)

- Massaging the tract also causes the release of Oxytocin which aids in semen transport.
Conclusion

- After AI is completed, normal fertilization will take place and a calf should be born in approximately 283 days.

AI QUESTIONS #1-20
Answer on a separate sheet of paper and turn into Mrs. Berry or Mrs. Adams
AI TEST QUESTIONS

Multiple Choice
1.) The most common type of semen collection is
   A. Electroejaculation  
   B. Rectal massage  
   C. Artificial vagina  
   D. Palpation
2.) Motility refers to the
   A. Activity of the sperm  
   B. Shape of the sperm  
   C. Size of the sperm  
   D. Color of the sperm
3.) A semen sample must contain at least ___ sperm per cc after thawing to be used for AI.
   A. 40 million  
   B. 20 million  
   C. 5 million  
   D. 12.5 million
4.) Common ingredients used in semen extenders include
   A. Milk  
   B. Egg yolk  
   C. Antibiotics  
   D. All of the above

AI TEST QUESTIONS

5.) One straw contains enough semen to inseminate _____ cow(s).
   A. 2  
   B. 1  
   C. 1.5  
   D. 3
6.) Semen is deposited into the
   A. Right or left uterine horn  
   B. Cervix  
   C. Vagina  
   D. Body of the uterus
7.) The normal gestation period for a cow is
   A. 150 days  
   B. 365 days  
   C. 283 days  
   D. 205 days
8.) An advantage of AI is
   A. Use of superior bulls  
   B. Improve weaning weight  
   C. Reduce spreading of disease  
   D. All of the above are advantages
AI TEST QUESTIONS

9.) Morphology refers to the
A. Activity of the sperm
B. Shape of the sperm
C. Size of the sperm
D. Color of the sperm

10.) Semen is frozen until it reaches a temperature of
A. -320° degrees F
B. -100 degrees F
C. -50 degrees F
D. -5 degrees F

True/False
T  F  11.) Cows must be in estrus before they can be inseminated.
T  F  12.) Estrus synchronization is a disadvantage to producers because it is time consuming and doesn’t always work.
T  F  13.) Semen should be thawed extremely quickly to avoid loss of live sperm cells.
T  F  14.) The AI rod should be wrapped in a paper towel before transporting it to the insemination site to avoid contamination.
T  F  15.) The technician should insert one hand into the cow’s rectum to locate the cervix.
T  F  16.) The rod should be removed swiftly from the reproductive tract to avoid losing any of the semen.
T  F  17.) Massaging the tract allows the semen to travel to both right and left uterine horns.

AI TEST QUESTIONS

T  F  18.) Semen can be collected by rectal massage, electroejaculation, or artificial insemination.
T  F  19.) AI is simple and doesn’t require special training.
T  F  20.) The purpose of adding extender to semen is to for dilution, nourishment and protection.