

Unit B: Understanding Animal Reproduction

Lesson 3: Understanding Animal Reproduction Technology

Terms

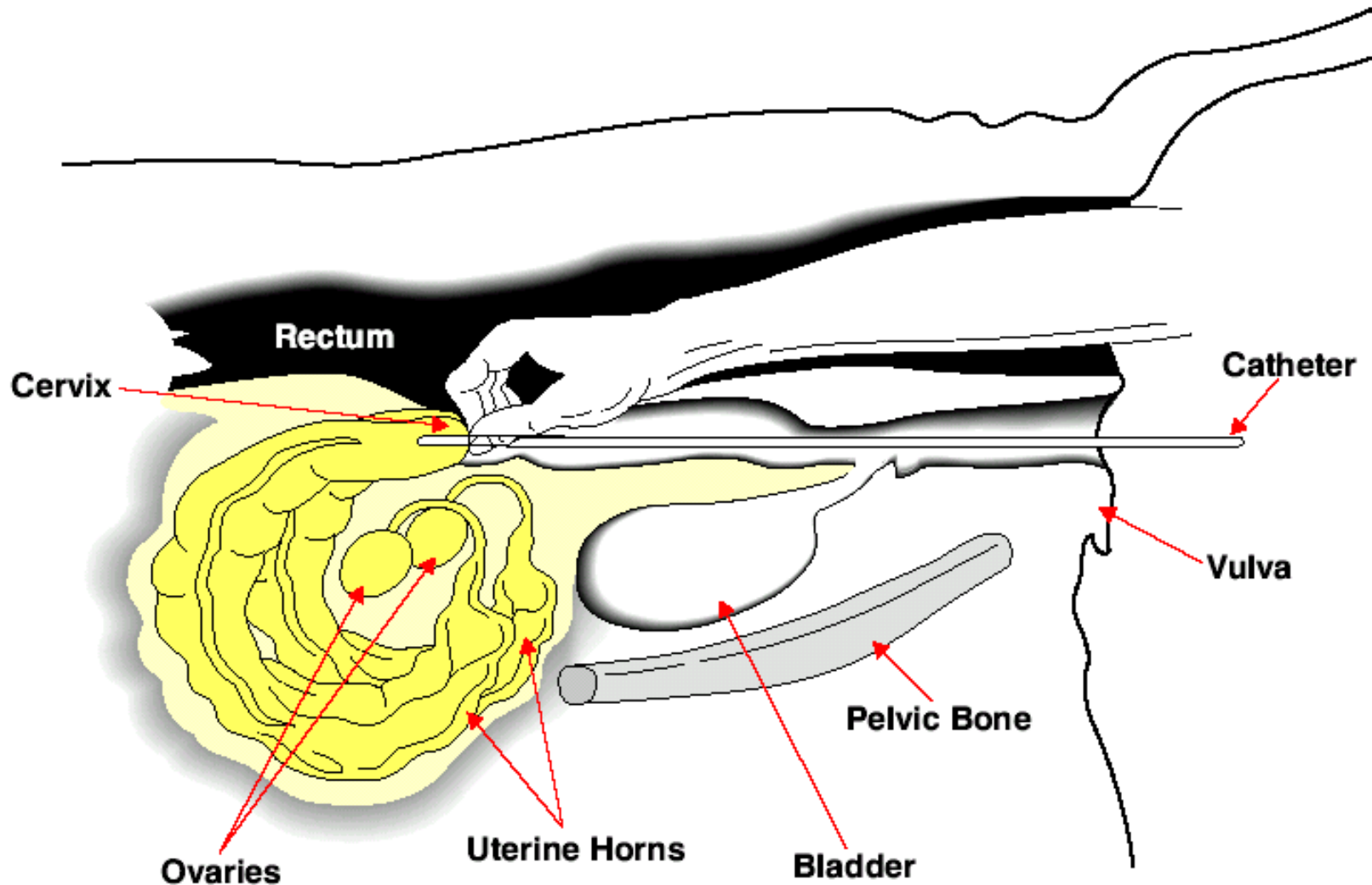
- Artificial insemination
- Cloning
- Donor female
- Embryo transfer
- Estrous synchronization
- Genetic engineering
- Progestin
- Prostaglandin
- Recipient female
- Sexed semen
- Standing heat
- Superovulation

What are the steps involved in artificial insemination?

Artificial insemination is the placing of semen in the female reproductive tract by artificial techniques.

- There are several different segments of this process.

Artificial Insemination in Cows

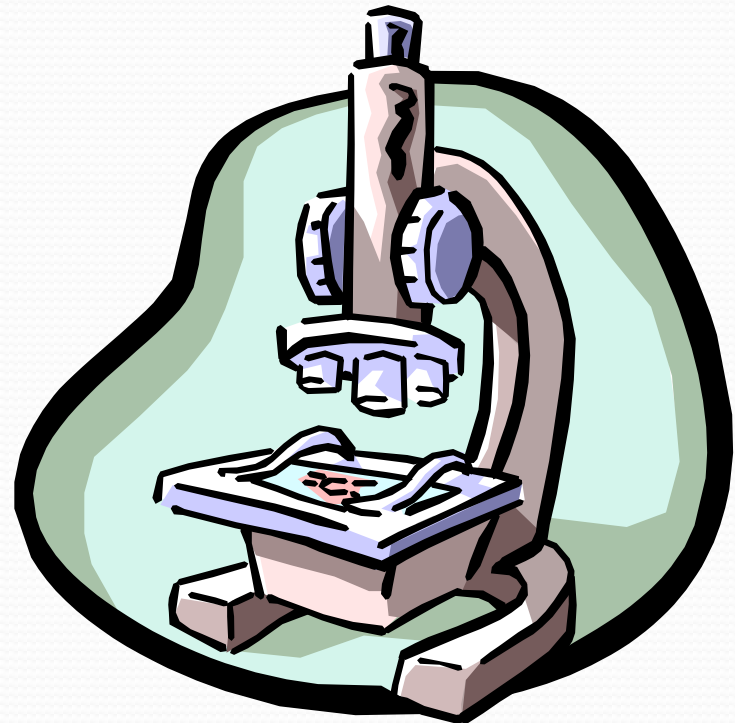


Semen Collection

- ▣ Artificial insemination requires that semen be collected from the male. Semen may be collected via manual stimulation, or use of an artificial vagina.
- ▣ The technique used depends on the species from which the semen is being collected.
- ▣ After the semen is collected from the male, it is evaluated, slowly cooled and frozen at a temperature of -196°C .
- ▣ Liquid nitrogen is used to obtain these extreme temperatures. Properly frozen & stored semen can remain viable and be used 30 to 40 years later.

Sexed Semen

- ▣ **Sexed semen** is semen that has been prepared to produce all male or all female offspring.
- ▣ It is collected in the same manner as other semen used in A.I.
- ▣ Generally sexed semen will predict sex with approximately 90% accuracy and cost is normally about four times higher than the cost of unsexed semen.



Detecting Estrus

- In order to insure high conception rates, the artificial insemination technician must be able to detect when the female is in estrus or heat.
- Estrus signs vary between species. The best indication of estrus for most species is standing heat.
- **Standing heat** is the stage of estrus when a female stands when mounted by another animal. Many animals display extra mucus and redness in the vulva.

Insemination

- The timing and the placement of semen vary depending on the species.
- All require that frozen semen be thawed properly to 33 to 34°C.
- Fresh semen should be used within an acceptable time, depending on species.

What are some of the advantages & disadvantages of artificial insemination?

- As with all management practices in cattle production, there are several advantages and disadvantages of using artificial insemination.



Advantages

1. Increases the use of outstanding sires—Through artificial insemination, many producers can use an outstanding sire that isn't present to breed their females.
2. Eliminate danger of keeping a sire—Some hazards are usually involved in keeping a sire on site or separate facilities are eliminated.
3. Reduce sire costs—In smaller herds, artificial insemination is usually less expensive than the ownership of a quality sire including building, feed, and labor costs.
4. Increase number of different sires in herd—Through artificial insemination, it is possible to introduce several different genetic lines into the herd through the use of different sires.

Disadvantages

1. Requires skilled technician—In order to be successful, artificial insemination must be carried out by a person that has received training and had experience.
2. High initial investment—Considerable money is necessary to begin an artificial insemination operation.
3. Equipment costs can be high along with cost of training needed to conduct procedure.
4. Increase management—To be successful, the level of observation and management by the producer must increase in an artificial insemination operation.



What are estrous synchronization, embryo transfer, cloning, and genetic engineering?

- There are several other techniques used in cattle reproduction in addition to artificial insemination.

Estrous Synchronization

- **Estrous synchronization** is bringing a group of animals into heat simultaneously. This is done to assist the producer in scheduling breeding & birthing. Synchronization usually involves the use of prostaglandin, progestin, or a mix of the two.
- **Prostaglandin** causes the corpus luteum to stop producing progesterone.
- This allows the animal to come into estrus. **Progestin** has the effect of keeping progesterone levels high, holding animals in an extended diestrus. When the progestin source is removed, the animal quickly comes into estrus.

Embryo Transfer

- **Embryo transfer** is moving embryos from one female, called the **donor female**, to the reproductive tract of another female called the **recipient female**. Donor females usually carry extraordinary genetics. Recipient animals have far less worth and are used as surrogate mothers.
- **Superovulation** involves getting a female to release more than the usual number of eggs during a single estrous cycle. Embryos can be frozen in liquid nitrogen and transferred later; however, the success rate is higher when transferring fresh embryos.

Cloning

- **Cloning** is the production of one or more exact genetic copies of an animal.
- **Methods of cloning:**
- 1st method lets embryos grow to the 32-cell stage before splitting into 32 identical embryos.
- 2nd method takes a cell from an adult animal. This method was used in creation of the famous sheep Dolly.
- 3rd technique involves taking cells from primordial germ cells during fetal development. These are more stable cells and can be cultured and frozen for indefinite periods of time.

Genetic Engineering

- **Genetic engineering** is removing, modifying, or adding genes to DNA.
- Genetic engineering using gene-splicing or recombinant DNA along with other reproductive technology will have a great deal of impact on future animal production.

Review/Summary

- How does the artificial insemination process work?
- What are two advantages to artificial insemination?
- What are two disadvantages to artificial insemination?
- What are two techniques used in addition to artificial insemination in animal reproduction?