


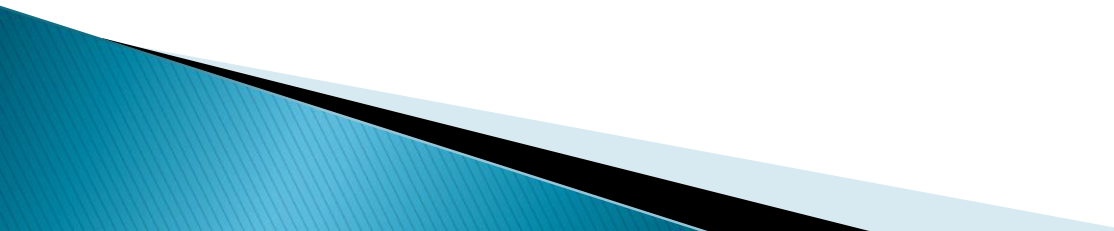
# Reproductive Technology



# Sexed Semen

- ▶ Available only in the cattle industry
  - ▶ First commercially available around 2010
  - ▶ Bovine X chromosome is larger and “heavier” than the Y chromosome
  - ▶ Two different technologies for sexing and separating X and Y carrying sperm cells
  - ▶ Lower pregnancy rates have been observed
  - ▶ May need to AI multiple times and with more straws of semen
  - ▶ **Why would you want sexed semen?**
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# Artificial Insemination

- ▶ Advantages:
  - ▶ More rapid improvement through use of superior sires
  - ▶ Reduction or elimination of cost and risk of maintaining a sire for a small herd/flock.
  - ▶ Reduced risk of spreading reproductive diseases.
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# Artificial Insemination

- ▶ Disadvantages
  - Requires additional facilities
  - Cost of equipment and labor
  - Time to heat check

# Artificial Insemination

- ▶ Professional AI technician used to go from farm to farm to AI cows. Was on call daily.
  - ▶ Now, most producers AI. Still a few professionals, and they work for semen companies.
  - ▶ Largest AI industry is... TURKEYS!
    - What part of the turkey is generally most in demand?
    - The breast. We've genetically selected for such large breast size that a Tom cannot physically breed a Hen. His breast gets in the way...
    - Only 5–6% of the beef, sheep, and horses are AI'd.
    - About 66% of the dairy cattle are AI'd.
- Not sure of the actual %, but many of the hogs.

# Artificial Insemination

- ▶ Collection usually done with an artificial vagina and a jump steer or dummy.
- ▶ Injured males collected using an electro-ejaculator (probe, rectally). Heat Wave was collected this way for YEARS because he was CRIPPLED!
- ▶ Flush Quality (embryo transfer) semen is generally packed at 40 million sperm per 0.5cc straw.
- ▶ Dairy bulls generally are more productive per collection than beef bulls (400 straws per collection vs. 250 per collection).
- ▶ Sexed semen is usually packed at 10 million sperm in 0.25cc straw.

# Artificial Insemination

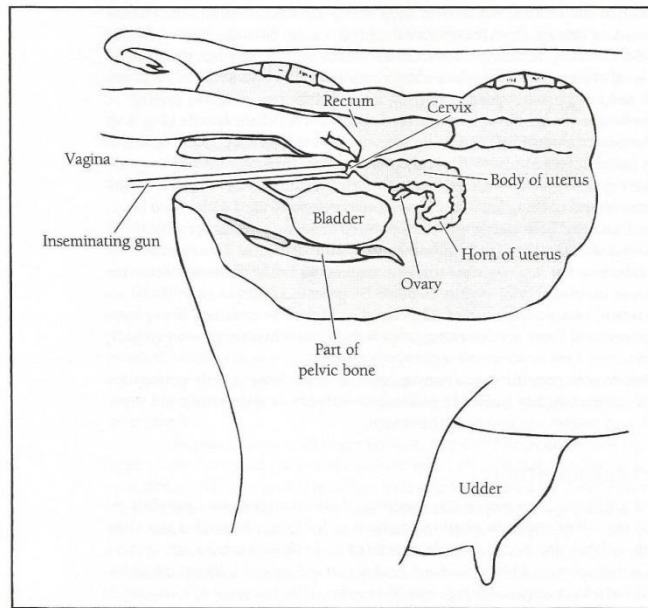
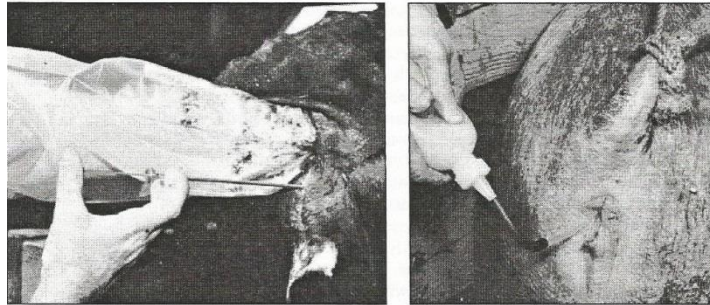
- ▶ Semen is checked for concentration and motility. Extended (glycerol, egg yolk, milk, and buffers).
- ▶ If to be used fresh, ideally kept at 40<sup>0</sup> F.
- ▶ Frozen in plastic straws using liquid N, -327 F.
- ▶ Freezing stops metabolism.
- ▶ Thaw in 95–98<sup>0</sup> F water for 60 seconds. Must dry the thawed straw (water is toxic to semen, so is sunlight, so keep the thawed straw out of the sun), load into AI rod – plug end first, cut the crimped end, cover with plastic sheath, keep the whole apparatus WARM (pants, arm pit)!

# Artificial Insemination

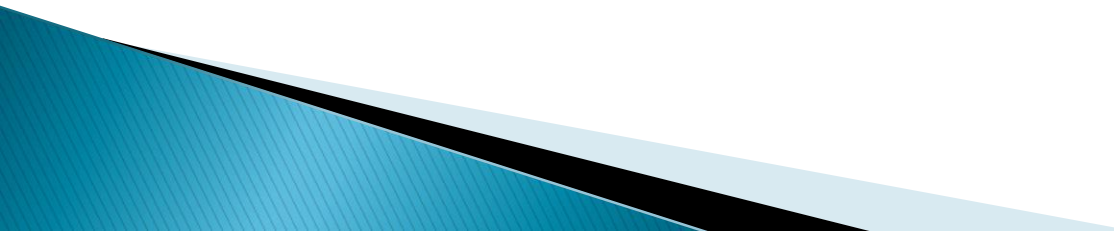
- ▶ Cattle – once the rod is in the Os cervix (cervical opening), pass the rod through three cervical rings (feel it pop through each ring), go just past the cervix into the uterus (not into either uterine horn), and dump the semen.
- ▶ AI cattle 12 hours after standing heat. Lots of new data shows cattle in heat can be AI'd one time in a 24 hour period.
- ▶ KEEP GOOD RECORDS! Write down date, time, sire used (name and code, did you use the 'right' sire???), and cow number.



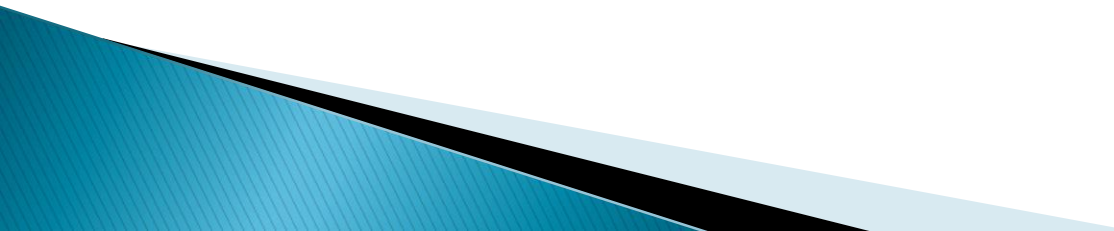
# Artificial Insemination



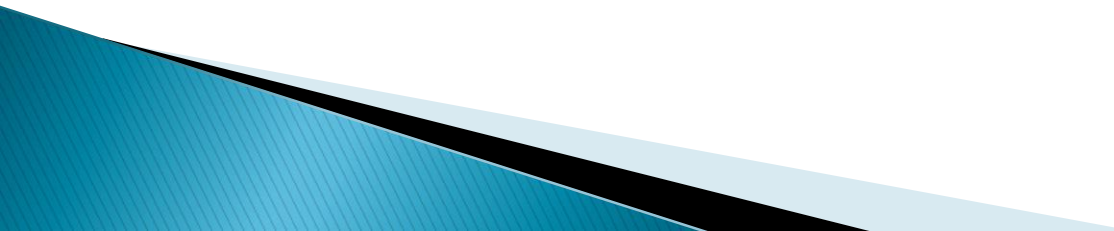
# Artificial Insemination

- ▶ Breed sows twice while they are standing, 8 hours apart.
  - ▶ Ewes, usually done laparoscopically (through the belly wall). Difficult to pass an AI rod through their cervix. AI during standing heat.
  - ▶ Cattle conception rates (with really good heat detection) of 80–85%.
  - ▶ Hogs also 80–85%+.
  - ▶ Ewes 60–75%.
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# Estrus Synchronization

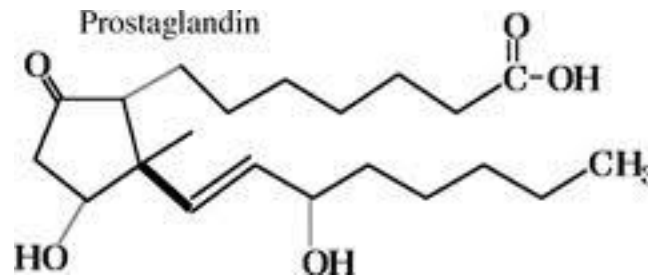
- ▶ Lab research in the 1970's determined that prostaglandin had the ability to regress the corpus luteum and cause estrus.
  - ▶ 1979, USDA authorized the sale of Lutalyse, a chemical analog of prostaglandin for estrus synchronization of cattle.
  - ▶ Only effective when a CL exists, cattle day 5–18. of their 21–day cycle.
  - ▶ Use a one–shot program or two–shot program.
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# Estrus Synchronization – Advantages

- ▶ Breed as many of the flock/herd at one time/within a couple days.
  - ▶ Reduces labor.
  - ▶ Much more organized and efficient production system.
  - ▶ More efficient marketing system (greater numbers that are more consistent size/age), should result in more \$\$\$.
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# Prostaglandin – One shot

- ▶ Cows with functional CL's that regress, come into heat within 48–72 hours.
- ▶ In theory, about 2/3 of the cows will express estrus.
- ▶ Heat detect or make sure there's enough bull power.

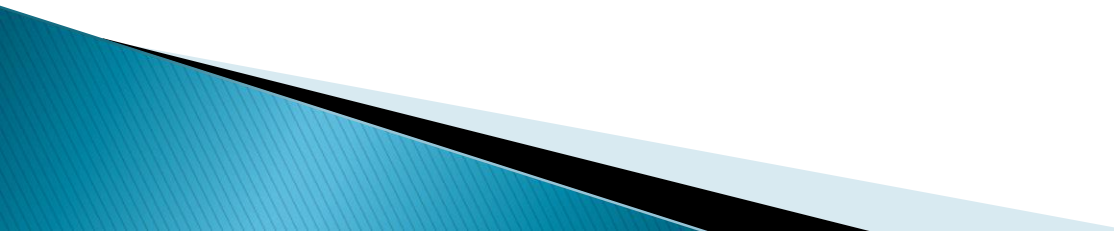


# Prostaglandin – Two shots

- ▶ Give first shot, cows with functional CL's that regress come into heat – get 'em bred.
- ▶ Cows that don't come into heat, get a second shot. Catches the cows that did not have a functional CL or did not respond to the first shot.



# Estrus Synchronization

- ▶ Progestins – Delay estrus and ovulation in cycling females. Mimics the effects of progesterone, natural hormone that blocks estrus and maintains pregnancy.
  - ▶ Can be given by injection, implants, or orally.
  - ▶ Can induce puberty in beef heifers by combining progesterone and prostaglandin.
  - ▶ Feed MGA (melengesterol acetate, synthetic progesterone) for 14 days, followed by prostaglandin injection 16 days later.
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# Estrus Synchronization



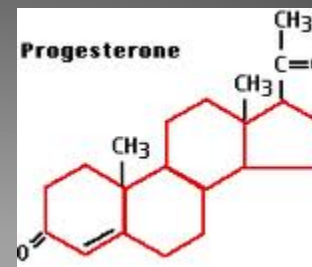
- ▶ CiDR's: (Controlled internal drug release) Intravaginal progesterone–releasing insert. While inserted, keep the female from coming in heat.
- ▶ Two primary protocols:
- ▶ CiDR on day 1, removed day 7, give prostaglandin shot day 7, heat detect and breed.
- ▶ CiDR and GnRH injection (gonadotropin releasing hormone) on day 1, CiDR removed day 7, give prostaglandin shot day 7, heat detect and breed.



# GnRH – Gonadotropin Releasing Hormone



# CiDR

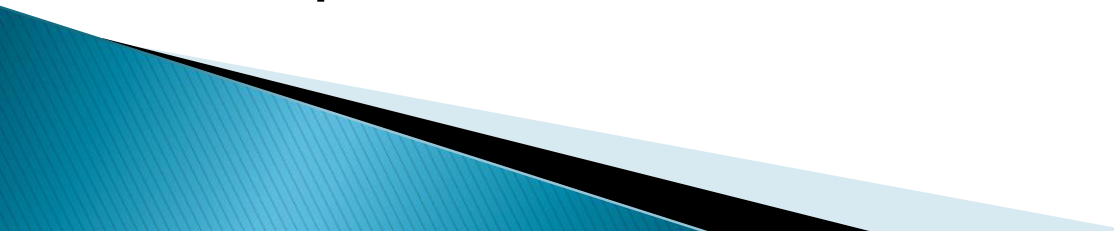


- ▶ Ewe CiDR and applicator.
- ▶ Make sure the 'tail' is toward you and the 'wings' are away from you.

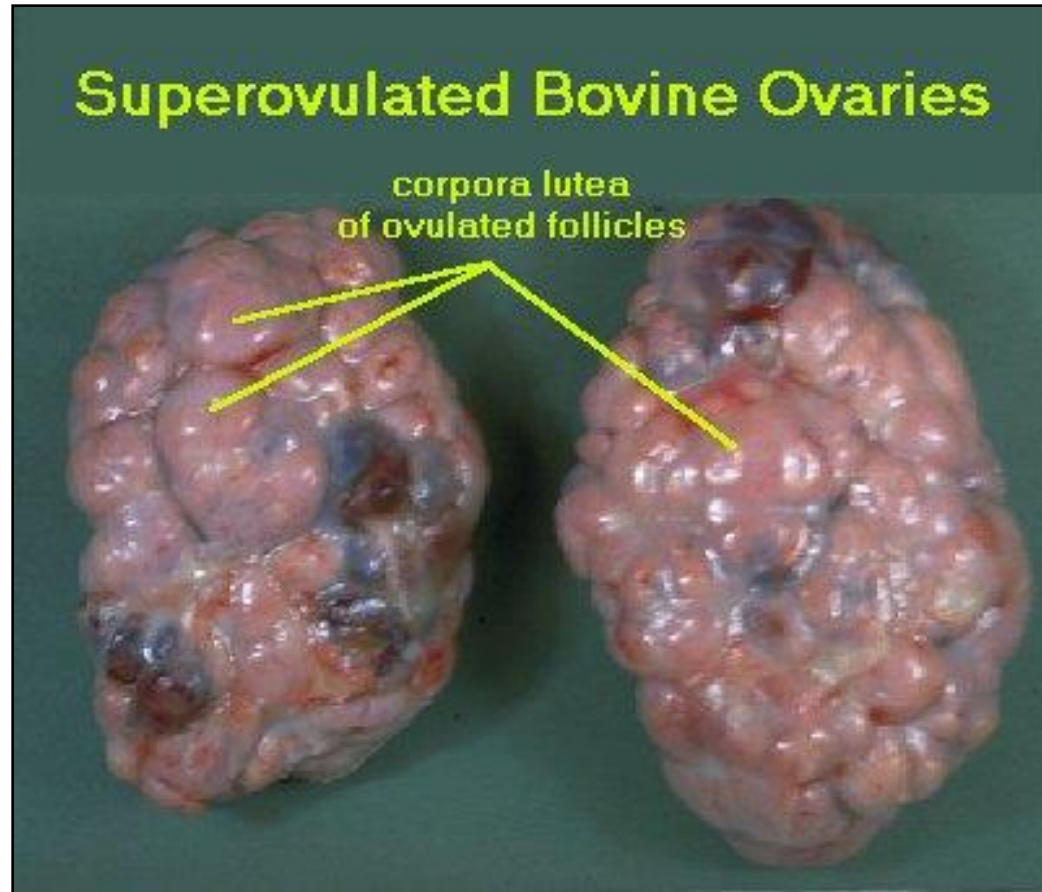


- ▶ Cattle CiDR and applicator.

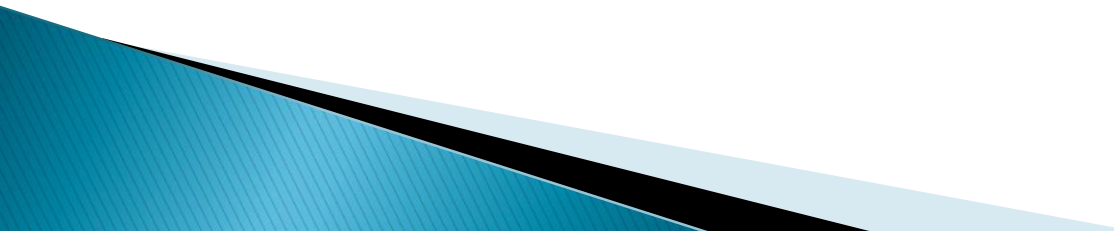
# Embryo Transfer

- ▶ Superovulate a donor female to produce many ova, mate the ova (in the donor or in vitro/in a Petrie dish), collect the embryos for transfer into a recipient female of the same species.
  - ▶ Use to increase the number of offspring from outstanding females. (create greater demand, generate more dollars due to increased demand for those genetics).
  - ▶ Opportunity for genetic testing of males suspected as carriers of an undesirable trait.
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# Reproductive Functions (Female)



# Embryo Transfer

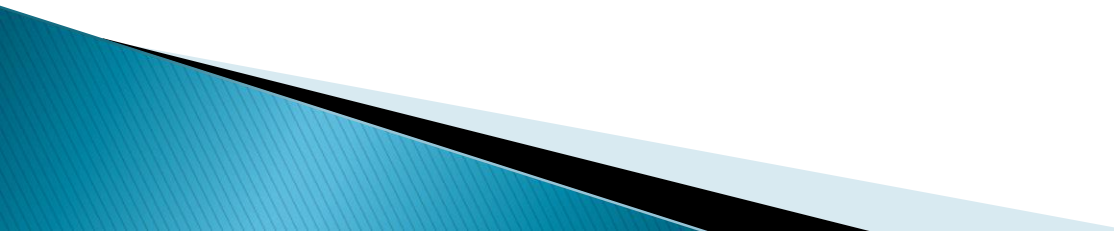
- ▶ World movement of embryos (instead of live cattle) is much easier, less costly, and decreased disease risk.
  - ▶ Increased diversity of genetics available from many sources.
  - ▶ Long-term storage provided by freezing (cryopreservation).
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# Embryo Transfer

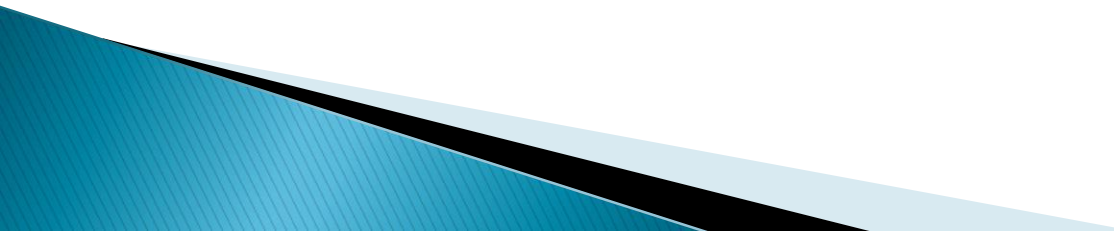


- ▶ Give FSH shots twice daily (as close to 12 hours apart as possible), 4/4.5/5 days (depends on breed, age of the donor, and past history).
- ▶ High dose is 3.5 cc of FSH. Usually start at 2.5 cc of FSH and dose decreases to 0.5 cc for last shot.
- ▶ Brahman-influenced cattle are super-sensitive to FSH. Four-day shot protocol and dose is usually pretty low 2.0 cc and less.
- ▶ Insert CiDR and give GnRH shot on day one. FSH shots day nine – 14.

# Embryo Transfer

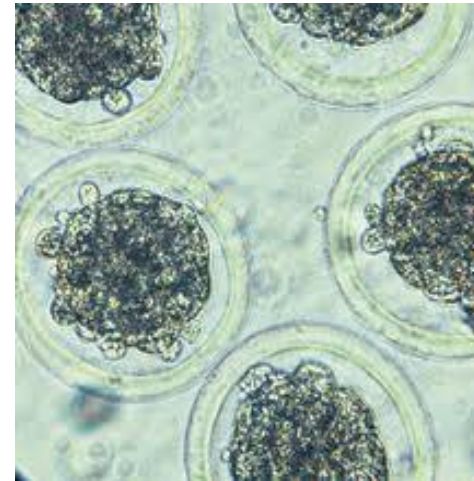
- ▶ Give Prostaglandin shots with the last two shots of FSH to cause regression of the corpus luteum (hopefully there are many to regress).
  - ▶ Donor generally comes in heat 36–60 hours after the last shots, breed at least twice, generally at 12 and 24 hours after standing heat.
  - ▶ Often breed three times: during standing heat, at 12 hours after (using two straws of semen), and 24 hours after standing heat.
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# Embryo Transfer

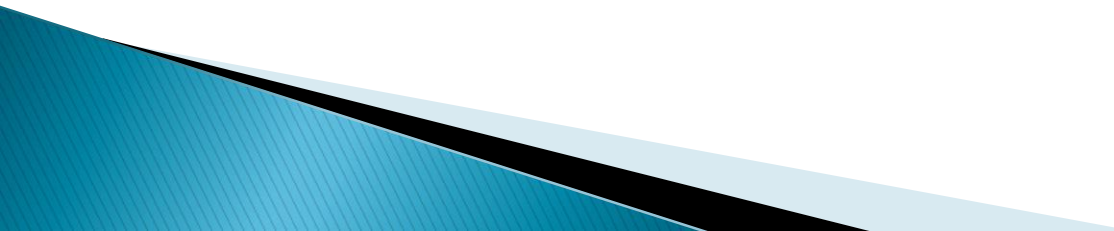
- ▶ Embryologist uses a Foley Catheter (has a balloon in the end) to block each uterine horn and fill with fluid.
  - ▶ Catheter has a hole in it, embryologist massages uterine horns to force fluid and embryos out through hoses into a cup (has a very fine screen to collect the embryos). Excess fluid runs through the cup.
  - ▶ Find and grade embryos using a microscope.
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# Embryo Transfer



# Embryo Transfer

- ▶ Give recipients Prostaglandin shots 12–24 hours before the donors get Prostaglandin.
  - ▶ Ideal to match same stage of embryo maturity to stage of reproductive cycle of the recipient.
  - ▶ Embryo is implanted in the same uterine horn that has an ovary with a CL on it.
  - ▶ Embryologist goes as far up that uterine horn as possible.
  - ▶ Longer, thinner (0.25cc) rod.
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# Embryo Transfer

- ▶ Good embryologist can get 80–85% pregnancy rates with fresh embryos and 70–75% with frozen embryos.
  - ▶ Conception rate depends on environmental temperature the day of the flush, temperature of the work room where the embryos are sorted and graded, freezing technique of the embryologist (quality of work), quality of the recipients (body condition/mineral status), etc.
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