Equine Breeding

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The Stallion

- Live Cover vs. Semen Collection
- Management
- Collection and Evaluation
- Semen Extension/Freezing/Shipping

Bayron 885

Imported Premium A
Swedish Warmblood stallion

Advantages to Live Cover Breeding

- natural semen placement in mare
- can be done in a pasture setting
- semen is not shipped and at risk of damage
- stallion can breed the same mare several times that day or several days in a row
- Jockey Club requires this which allows stud fees on valuable animals to remain high

Disadvantages to Live Cover Breeding

- risk of injury to stallions (mares kicking)
- dangerous for handlers (things get wild!)
- need mare hobbles, twitch, sedative
- only one mare bred per ejaculate
- in Thoroughbreds, once a stallion is deceased, there is no frozen semen available (for Jockey Club registry)

Advantages to Semen Collection

- use for artificial insemination
- evaluation of semen
- shipping semen long distances
- cryopreservation
- simulates natural mating (phantom/AV)
- collects whole ejaculate and can divide among many mares
- minimizes risks to stallion and handler
- minimizes spread of disease

Disadvantages to Semen Collection

- stallions new to this method can be dangerous
- need "phantom" for mounting
- need mare in heat available for teasing
  - use of ovarectomized mares artificially brought into "heat" using Estradiol
- need to coordinate collection, processing and shipping during shipper's hours (FedEx)
- latex vs. disposable liners
- cost of equipment


REZNOR

Stallion Handling

- needs consistency
- ideally use same handler
- equipment: chain in mouth, Chifney bit, etc.
- many recognize surroundings
- some learn “If you turn left coming out of the stall, it’s just turnout; if you turn right, it’s time to breed!”

Stallion Handling

- safety first
- but do not correct stallion for “acting like a stallion”
- once libido is decreased due to behavioral corrections, it is very hard to get back

Semen Collection

- need “tease” mare to excite stallion
- stallion mounts “phantom” mare and ejaculates into artificial vagina
- stallion mounts “jump” mare and penis is deflected into artificial vagina
- stallion is collected while standing on the ground; learns routine and tease mare becomes unnecessary; sometimes better for “hot” stallions

Semen Collection

- Colorado or Missouri type of Artificial Vagina (AV)
- phantom can have internal AV or "cut-out" for deflection of penis into AV (preferred)
- proper temperature of 37˚C is necessary
- proper lubrication is necessary
- some stallions don't like the feel of disposable liners - need latex


Next Generation
Semen Collection Bottle
Next Generation
Semen Collection Bottle


°C
THM-104
ANIMAL
REPRODUCTION
SYSTEMS
CHINO, CA 91710


NOT FOR CLINICAL USE
General Purpose Incubator
Barnstead|Lab-Line
SLIDE WARMER

Semen Evaluation

- volume, concentration, motility
- use densimeter or hemocytometer for concentration assessment
- use warm slide on microscope stage for motility assessment

590a Densimeter
CHARGED
ZERO
ARS
COUNT
Animal Reproduction Systems
TOP
TOP
ON
OFF
T0.5A

Calculate Insemination Dose

$$\frac{\text{optimal insemination dose}}{[(\text{concentration}) \times (\% \text{ motility})]} = \text{ml of raw semen/breeding dose}$$

$$\frac{500 \times 10^6 \text{ PMS (progressively motile sperm)}}{[(\text{concentration}) \times (\% \text{ motility})]} = \text{ml of raw semen/breeding dose}$$

Examine your volume and divide volume by ml per breeding dose to find out how many mares can be inseminated with this ejaculate.

Always estimate amounts on the “low end” to be sure to not overestimate the numbers of mares that can be bred per ejaculate (better to be safe that sorry)!

Extender

(from B.W. Pickett, Professor Emeritus, Colorado State University)

- increases volume of ejaculate (increase number of mares bred)
- permits effective antibiotic treatment of semen (reduces the spread of venereal disease and uterine infections)
- prolongs the survival of spermatozoa
- protects spermatozoa from unfavorable environmental conditions
- aids in proper evaluation of sperm motility
- increases pregnancy rates (sperm remain fertile longer in extender than in seminal plasma!)

Extender

- First stallion extender was half-n-half cream + gelatin
- Then milk was used but needed to be heated for detoxification
- Then non-fat dried skim milk (used today)
- For Freezing: egg yolk + extender
  - need nutrient (glucose or sucrose)
  - buffer (balance pH and osmolarity)
  - cryoprotectant (glycerol - replaces water in cell)
  - antibiotic (kills bacteria but not viruses)

Freezing Semen

- centrifugation extender needed to remove as much seminal plasma as possible
- freeze in liquid nitrogen
- older stallions: phospholipid bilayer has increased tendency to crack during thawing


MVE Millennium II
XC 24
MVE LAB 30

Fertility and Success with Frozen Semen

- rate lower
- breeding dose is not standard
- in population:
  - 25% freeze well
  - 50% freeze acceptably
  - 25% freeze poorly

Shipping Semen

- fresh cooled extended
  - packaged in Whirl bags or centrifuge tubes
    - Equitainer
    - Equine Express disposable box
- frozen
  - liquid nitrogen vapor shipper

THE HAMILTON-THORN
EQUITAINER
II
SDR
SDR
RUSH
FRAGILE
PLEASE
RETURN BOX
Equine Express II
Protected By Patents: 5,983,661 and 6,230,515

Conclusion - Stallion

- both Live Cover and Semen Collection have their advantages and disadvantages
- necessary to evaluate individual situations
- Semen Collection allows for preservation, the ability to breed more mares at once, and to breed long distance
- Live Cover lets stallions pasture breed, is more natural, and is required by some registries e.g. The Jockey Club

The Mare

- Live Cover vs. Artificial Insemination
- Teasing vs. Ultrasound
- Management of the Estrous Cycle
- Pregnancy detection

Linn

imported Premium A Swedish Warmblood mare

Advantages to Live Cover Breeding

- natural semen placement by stallion
- can be done in a pasture setting
- mare can be bred several days in a row until she is out of heat
- some registries require this (Jockey Club)

Disadvantages to Live Cover Breeding

- risk of injury to mare (stallion kicking)
- risk of injury to foal (wet mare)
- dangerous for handlers (things get wild!)
- need mare hobbles, twitch, sedative

Advantages to Artificial Insemination

- can be done in the safety of stocks
- can breed to stallions who are far away

Disadvantages to Artificial Insemination

- MUST carefully monitor heat cycle in order to plan ordering of semen
- stallions are often collected on a schedule which may not match up with the mare's ovulation schedule
- sometimes difficult to predict exact time for insemination
- cost of lab supplies, shipping semen, veterinarian
- cannot use this method for Jockey Club registration

When to Breed?

- teasing mare with stallion
- ultrasound monitoring of follicle growth
- both methods work best if you know your mares and their cycles

Teasing Methods

- mares in stalls and walk stallion down aisle
- stallion in stall and bring mares individually to him
- teasing over a wall or barrier
- mares in paddocks and bring stallion out to paddock (risk of subordinate mares not showing signs of estrus)
- mares in paddocks near stallion in separate paddock; monitor mares' behavior

Ultrasound

- ideally done daily when ovulation is getting near
- need to know how to read images
- risk of rectal tear (use Buscopan to relax smooth muscle of the intestine to decrease this risk)
- some mares need sedation


Thermo
CENTRA CL2

Estrous Cycle

- total 21 days
- estrus “standing heat” 5-7 days
- diestrus 14-16 days

Management of the Estrous Cycle

- use of prostaglandins
- use of progestins
- use of gonadotropins
- artificial photoperiod
- use of marbles in uterus
- other hormonal therapies

Prostaglandins

- Lutalyse (natural $PGF_{2\alpha}$ Dinoprost)
- Estrumate (synthetic analog Cloprostenol)
- regress corpus luteum to allow mare to cycle back into heat
- only works if given when there is a CL to regress!
- “short cycle” - give 6 days after last ovulation - mare will come into heat in 3-5 days after treatment

Progestins

- Regumate
- can be used to maintain pregnancy; given until day 150
- used to synchronize estrus for embryo transfer programs
  - give progestin for 8-10 days, give injection of $PGF_{2\alpha}$ to assure regression of any CL; heat occurs in 4-5 days, with ovulation occurring 8-15 days after the $PGF_{2\alpha}$ injection

Gonadotropins

- Sucromate (replaces Deslorelin)
  - FDA approved in 2010
    - controlled release injectable
- GnRH agonist
- induces ovulation

Artificial Photoperiod

- normal first ovulation of the year in Wisconsin: April 13 ± 11days
- putting mare under lights will shorten anestrus to allow for earlier breeding in the season
- need minimum of 10 ft-candles
- 100 -200 Watt bulb for 12x12 stall
- fixed length period 14.5-16 hrs
- option: add 2.5 to 6 hrs at dusk (increase slowly)
- begin light treatment in early December
- from onset to first ovulation is 60-70 days

Intrauterine Glass Balls

- suppresses estrus in cycling mares
- uterine prostaglandin secretion pattern altered
- formation of persistent corpora lutea
- 42% remained out of heat for an average of 3 months
- no significant problems due to treatment

Other Hormonal Therapies

- Human Chorionic Gonadotropin (hCG) - LH - like activity; induces ovulation
- Equine Follicle Stimulating Hormone (eFSH) - superovulation; stimulation of follicular development in transitional mares
- Oxytocin - evacuation of uterine fluid; induction of labor; management of retained placenta

Insemination

- use breeding stocks for safety
- wash vulva three times
- use sterile sleeve with sterile lubricant
- put your hand with the pipette into the vestibule and continue dorsally over transverse folds
- locate end of cervix
- put end of finger and pipette into cervix
- advance pipette 1-2” into uterine body
- deposit semen into uterus

Post-Breeding Infusion

- used to clear the uterus of excess fluid which has built up in response to a foreign object - semen (excess uterine fluid is detrimental to establishing/maintaining a pregnancy)
- 4 hours post-breeding (not post-ovulation), give oxytocin
- 6 hours post-breeding, intra-uterine infusion of antibiotics

Pregnancy Detection

- can detect embryo with ultrasound at 11 days after AI (embryo still mobile)
- embryo fixation occurs at day 16-17
- implantation begins at day 40 and is complete at day 140 when the formation of the microcotyledons is complete

Conclusion - Mare

- Live cover breeding is more natural and easier in a pasture setting; but dangerous when hand-breeding, especially when the mare has a foal at her side
- Artificial Insemination is more time consuming due to conscientious monitoring of the estrus cycle and ovulation
- This is easier with the ability to manage the estrous cycle and with the use of ultrasound
- Artificial Insemination allows breeding to stallions who are far away
- However, it can be difficult to order semen when needed (stallion collection schedule/shipping)

Summary

- Pros and cons to both Live Cover and Semen Collection/Artificial Insemination
- Limited by resources: equipment, cost, labor, ability
- Limited by Registry
- Enhanced by ability to manage the estrous cycle
- Enhanced by the use of ultrasound

Swedish Warmblood Premium AB Broodmare
Aquaria with Class I stud colt Björling (from frozen semen)