Synchronization of estrus and ovulation

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Estrous Synchronization

A management technique that makes use of hormones to control or reschedule the estrous cycle
Why synchronize?

Group females for parturition:
- decrease labour, decrease calving period
- reduce calving season

More uniform weaning weights

Reduce time required for estrus detection

Eliminate estrus detection with timed insemination

Goal in future - Fertility may be higher in combination with estrus detection.
Advantages of implementing a synchronization program

• Calves produced early in season will wean heavier because they are older

• Cows require 40-60 days to recover from calving before next breeding
  – Cows that bred earlier have better chance of maintaining 365 d calving interval the next year
Basis for Synchronization of Estrus

- Manipulate life span of CL
- Manipulate growth of follicles and timing of ovulation
Key components of estrous synchronization (Hormones)

1. Progesterone - prevents behavioural estrus
2. GnRH - controls LH surge, stimulates ovulation
3. PGF2a - luteolysis
The overall aim of oestrous control systems

“make some or all of the physiological changes regulated by these hormones occur in all animals at the same time, in order to synchronize the time of artificial insemination”.
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Synchronization Methods

Gonadotropins (GnRH protocols)

• Naturally occurring hormone that stimulates the release of LH and FSH that stimulates follicular development

• Protocols include Ovsynch and Cosynch
Synchronization methods

Prostaglandins

- Naturally occurring hormone that causes regression of the CL (luteolysis) and decreases progesterone secretion which results in a return to estrus
- Can expect estrus within two days following injection
- Protocols include PGF one-shot method and PGF two-shot method
Synchronization methods

Progestins

- Form of progesterone that extends the period of time progesterone is present and prevents animal from coming into heat

- Protocols include MGA+prostaglandin and CIDR
Principle of using PGF2a

Prostaglandin F2a treatment will regress active corpus luteum

Only effective on day 5 - 17 corpus luteum
Not effective on days 0 - 4
Days 18-20 there is no corpus luteum

Animals will be in estrus 2 - 5 days after injection

  Heifers ~ 50 hrs
  Cows ~ 72 hrs

Single injection to random animals 60 - 65% will respond
Protocol for One Injection of Prostaglandin (PGF)

- **Beginning day of protocol schedule**
- **PGF injection**
  - Causes luteolysis of functional CL
  - Injected females should show signs of estrus within 1-4 days
- **Insemminate females in estrus**
- **10 day estrus detection**

Females that have been inseminated prior to day 5 should not be administered PGF injection unless abortion is desired.
One Injection of PGF

• Advantages
  – Useful for detection of estrus in heifers and cows
  – Decreased drug cost
  – Limited animal handling

• Limitations
  – 10-25% of females may not be detected in estrus during days 0 to 10
  – Poor degree of synchrony on females that return to estrus
  – Must have CL
  – Length of estrus detection
  – Abortion
Normal Cycle - Estrus Every 21 Days

Blood progesterone (ng/ml)

Day of cycle (cow)

Estrus

PGF$_{2\alpha}$ Injections - Day 0 to Day 6 - No Effect

Blood progesterone (ng/ml)

Day of cycle (cow)

Estrus

PGF$_{2\alpha}$ Injections Between Day 6 to Day 17 Cow in Estrus in 3 Days

Blood progesterone (ng/ml)

Day of cycle (cow)

Estrus
To synchronize entire herd with PGF2α:

Give two injections 11-14 days apart

Cows responding to first injection have day 6 - 9 CL by time of second injection

Cows not responding to first injection will have day 6 - 17 CL by time of second injection
Protocol for Two Injections of Prostaglandin (PGF) with Split Insemination

1st PGF injection
(administered to all females scheduled to be synchronized)

Causes luteolysis of functional CL

Injected females should show signs of estrus within 1-5 days

Inseminate females in estrus

5 day estrus detection

2nd PGF injection
(only to those not inseminated)

Causes luteolysis of functional CL

Injected females should show signs of estrus within 1-5 days

5 day estrus detection

Inseminate females in estrus

Inseminate by appointment at 72 hr after PGF

Females that have been inseminated prior to day 11 should not be administered PGF injection unless abortion is desired.
Reasons for Variation in Response to PGF

Stage of the follicular wave
Heifers react faster than cows - follicular growth is faster in heifers
Animals may be pregnant
No CL may be present - Anestrus
Two Injections of PGF

• Advantages
  – Useful for detection of estrus in heifers and cows
  – Tighter synchrony than one injection method
  – Can use fixed insemination time after 2nd injection

• Limitations
  – Females must have functional CL
  – Length of estrus detection
  – Administration of PGF will cause abortion in pregnant animals
Progestogens

Principle:
Maintain the cow under the influence of progesterone until corpus luteum regresses, remove progesterone - animal respond to progesterone with estrus 2-5 days later

Can push animal out of anoestrous

Administration:
Injection - time consuming
Feed - mix in the ration
Melengesterol Acetate (MGA) 14 days
Implant - place in ear
Protocol for Synchronizing Heifers using MGA and Prostaglandin

**MGA** is a synthetic progestin (similar to progesterone) which blocks the release of LH and prevents follicle maturation and ovulation.

- MGA fed at a rate of 0.5 mg/head/day for 14 days.

- Discontinue MGA.

**PGF injection**
- 19 days after removal of MGA.

- Causes luteolysis of functional CL and a return to estrus.

- Estrus occurs between 2 and 5 days after removal of MGA, but females should NOT be inseminated due to low conception rates.

- Inseminate females in estrus.

- In 5 days, estrus detection.
MGA and Prostaglandin

- **Advantages**
  - Proven system for heifers
  - Inexpensive method
  - Can hasten cyclicity in anestrous females

- **Limitations**
  - Length of program
  - Must have appropriate feeding space to allow efficient consumption
  - Estrus synchronization may be variable
  - Must ensure uniform daily consumption of feed supplement prior to and during oral administration of MGA
Controlled Internal Drug Release (CIDR)

T-shaped vaginal suppository with a specially engineered coating that has been impregnated with progesterone.

Used in combination with PGF2α for cycling cows

Can be used after AI - inserted 14 days after AI and removed 7 days later

No PGF2α
A CIDR is inserted intravaginally and delivers progesterone at a controlled rate into the circulation. Progesterone exerts a (-) feedback on the hypothalamus, leading to the suppression of LH and FSH and prevents estrus and ovulation.

Causes luteolysis of functional CL and a return to estrus.

Insert CIDR

Days

PGF injection

Remove CIDR after 7 days

Inseminate females in estrus

5 day estrus detection

Removal allows LH pulse frequency to increase, resulting in estrus and ovulation of the dominant follicle.
CIDR

• Advantages
  – Useful for detection of estrus in heifers and cows
  – Induces cyclicity in a percentage of anestrous cattle
  – High pregnancy rates

• Limitations
  – Possible retention failure of CIDR
  – Cost per treatment may be higher than other methods
  – An additional day of processing for hormone treatment would be required to facilitate fixed time AI
GnRH

Controls LH surge, stimulates ovulation

Used with PGF2α
   OvSynch and PreSynch protocols

Main advantage:
   eliminates estrus detection
   timed artificial insemination
GnRH Synchronization Protocols

Basic GnRH synchronization protocols (Select Synch, Ovsynch, Cosynch) begin with the same format of an initial GnRH injection followed by a PGF injection 7 days later. Differences are derived from timing of insemination, estrus detection, parity, and hormone administration.

Select Synch

Ovsynch

Cosynch
GnRH

• Advantages
  – Higher and tighter rate of estrus synchrony compared to PGF protocols
  – Allows for estrus detection or timed AI

• Limitations
  – Higher cost due to hormone injections
  – Increase of time and labor
  – Not recommended for use in heifers
Oestrous Synchronization - Management Considerations

Have proper facilities to handle animals
Good reproductive records
Have enough A.I. technician help
Cows and heifers must be cycling
Use good fertility semen

Variable outcomes
  Cows not cycling - diagnose
  Recruit and ovulate subfertile follicles
  Silent estrus or miss estrus

Expense
Thank You