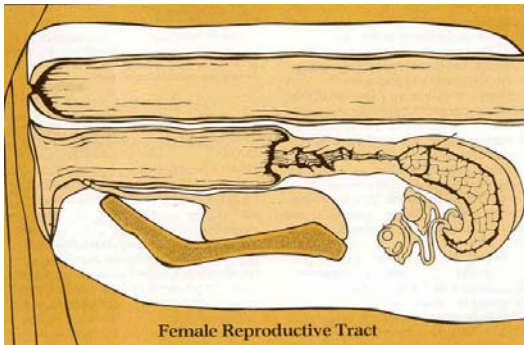


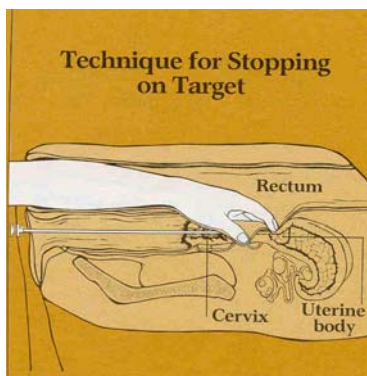
Female Reproduction
Artificial Insemination
Embryo Transfer

ANSC 1000
Introductory Animal Science

Artificial Insemination



Artificial Insemination



History of AI (Brief)

- AI is not new
- 14th century legend -- Arabian Sheik
- 1780 - Italian physiologist - First successful insemination of a dog
- 1900 - Ivanoff (a Russian) - First to successfully inseminate cattle and sheep
- 1949 - Polge (British) - discovered glycerol as a protectant for freezing

Artificial Insemination

- Use of A.I. in U.S.
 - Approx. 80-85% of dairy cows
 - Only about 5% of beef cows
- Future use
 - Brightened by use of products to synchronize estrus (Lutalyse, Estrumate)
 - Could be further enhanced if we could
 - ◆ easily sex semen
 - ◆ detect and breed cyclic cows not displaying estrus

Advantages of A.I.

- Maximum use of genetically superior sires
 -
 -
 -
- Greater selection of affordable sires
- Use incapacitated sires
- Improved management
 -
 -
 -

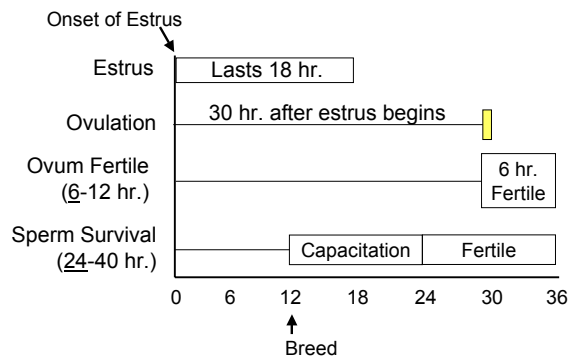
Disadvantages of A.I.

- Increased labor, management and facilities
- Accentuate poor genetics if an inferior sire is used

When to inseminate

For maximum conception, sperm and ovum must be at the site of fertilization at the peak of their fertility.

When to inseminate



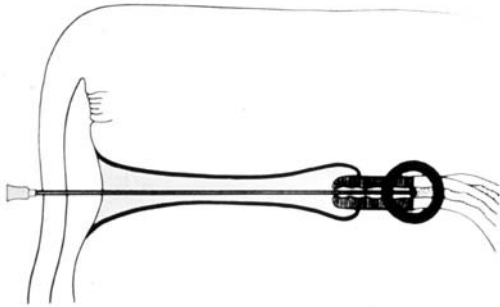
When to inseminate

AM - PM Rule

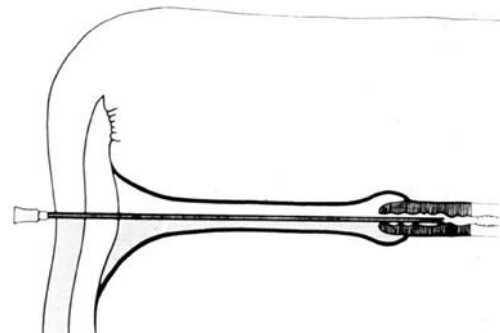
Universally accepted time for insemination:

Those cows detected in estrus in the morning are bred that same afternoon; those found in the afternoon are bred the next morning.

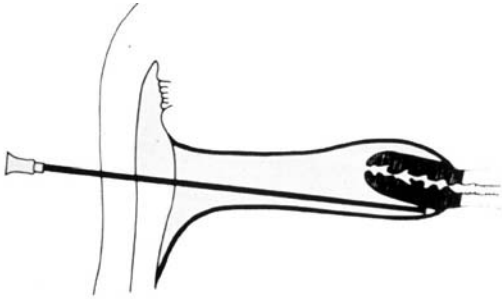
A. I. - Ideal



A. I. - Actual



A. I. - Blind Sac



**Superovulation
and
Embryo Transfer**

General procedures...

Superovulation

Hormone treatment of the female to induce multiple ovulations

Multiple births?

Superovulation to induce multiple births is not practical. Problems...

-
-
-
-

Superovulation for embryo transfer is useful.

Embryo Transfer Advantages

-
-
-

Embryo Transfer Disadvantages

-
-

ET Procedure

Outline

- Selection of cows
- Synchronization
- Superovulation
- Insemination
- Embryo collection & transfer

Selection

Transfer donors must be healthy, cyclic cows having superior genetic make-up.

Synchronization

-
- Rule-of-thumb:
- Prostaglandins

What are prostaglandins?

- Large group of chemically-related fatty acids
 - Synthesized from dietary essential fatty acids
- Discovery
 - Substance in seminal fluid that caused uterine contractions
 - Originally thought to be from the prostate gland
- Resemble hormones in their actions
- Produced by many tissues in body... ubiquitous
- Many physiological effects

What are prostaglandins? (cont.)

- Many physiological effects (such as...)
 - lower blood pressure
 - stimulate contraction of smooth muscle
 - prevent agglutination of blood platelets
 - important in normal lung function
- There are several series (classes) of PG
 - For example: PGE, PGF, PGI, PGH (E & F most common)
 - For ANSC 1000, concerned with just one: PGF_{2α}
- Action of PGF_{2α} ...

Prostaglandin F_{2α}

- Action of PGF_{2α} ...
 - Destroys the CL
 - Constricts blood flow to the ovary
- Mechanism - Normal estrous cycle (brief)
 - Ovulation has occurred & CL producing progesterone
 - Maternal recognition of pregnancy (~day 15-16)
 - Fetus produces a hormone -- receptor on uterus
 - If no fetus -- uterus produces PGF_{2α}
 - PGF_{2α} causes regression of CL → ↓ progesterone
 - FSH & LH stimulate development of new follicle

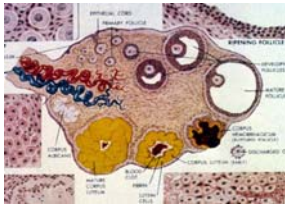
Back to estrous synchronization...

- Donor and recipient cows
- Rule-of-thumb:
- ProstaglandinF_{2α} used to synchronize

Superovulation

- Donors superovulated
- FSH stimulates development of multiple follicles on an ovary
- Equine chorionic gonadotropin

Estrous Synchronization and Superovulation



- Cows given PGF_{2α}
 - Lutalyse or Estrumate
- PGF_{2α} causes regression of the CL
 - i.e., all CL destroyed
- Second injection of PGF_{2α}

Estrous Synchronization and Superovulation

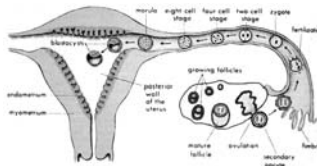
- Equine chorionic gonadotropin (FSH source) stimulates development of multiple follicles on an ovary



Insemination

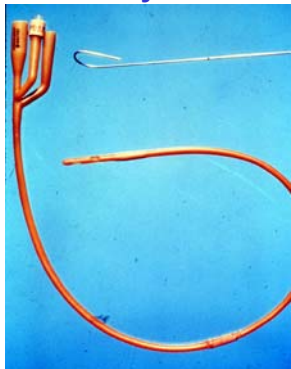
- Usually inseminate twice

Embryo collections & transfer



- 6 - 8 days
- Embryo should be in uterus
- Morula
- Foley catheter

ET - Foley catheter



ET - Foley catheter



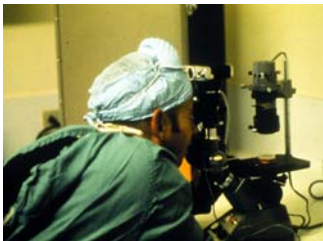
- Foley catheter
- Embryos flushed out
- Embryos separated and examined using microscope
- Morula (or early blastocyst)
- Infused into recipient cows
- Recover ~10 embryos per flush

ET - Foley catheter

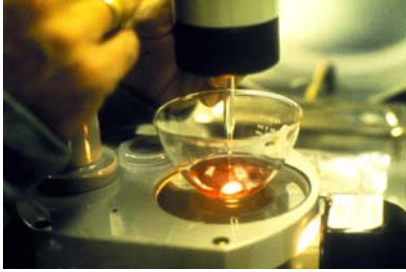


- Embryos flushed out

ET - Examining embryos

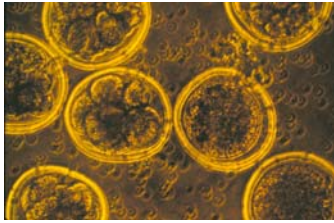


ET - Examining embryos



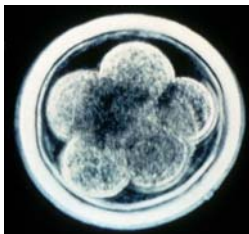
- Embryos separated

ET - Morulae as viewed in microscope



- Morula (or early blastocyst)
- Infused into recipient cows
- Recover ~10 embryos per flush

ET - Morula



- Isolated morula
- Will be transferred to recipient cow having a matched (synchronized) estrous cycle
- Development will continue as though the cow was bred "normally."

ET - End result