Puberty

• Hypothalamus-Pituitary response to estrogen changes
• Point at which regular ovarian cycles begin to occur
• Heat (estrus) observed
• Usually occurs at 35% mature weight
  – Typically at 7-9 months of age
Fig 24-2. Visualization of the reproductive tract of the cow, with the bladder beneath and the rectum and large intestine above (Courtesy of Select Sires)
General Functions of the Female Reproductive Tract

• Facilitate fertilization
• Provide environment for embryo and fetus
• Give birth to fetus
• Involutes and is repaired to become pregnant again
Uterus

UTERINE FUNCTIONS

A. Nourish the Embryo
   - contains uterine glands originating from the mucosal layer
   - secretion important for sperm survival
   - makes ----------------- or uterine milk
   - uterine gland secretion changes during the estrous cycle

B. Sperm Transport
   - Primarily -----------------------------
   - sperm move faster than can swim
C. -------------------------------

- Exchange with maternal system through the uterine wall (Caruncles; Placentom)

UTERINE FUNCTIONS Cont.

D. Control of estrous cycle and--

- communicates with the ovary as to presence of embryo
- determines the life of the

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Secretion of -------------------------in the absence of the fetus and regression of the corpus luteum
E. Expulsion of the fetus and Fetal Placenta

- muscles of myometrium contract during parturition
- responsiveness of myometrium varies with hormonal state

Oviduct

OVIDUCT FUNCTIONS

A. ---------------------------
B. ----------------------------
C. Maintains Early Embryo
   1. First few days spent in oviduct
D. Embryo Transport
E. Gamete Transport
   1. Moves egg down oviduct, primarily by cilia
   2. Moves sperm up oviduct, primarily by muscle
THE OVIDUCT (FALLOPIAN TUBE) (Figure 2-9)

A. Three Main Segments: Infundibulum, Ampulla, Isthmus

1. ----------------------------
   a. Funnel shaped structure closest to ovary
   b. Has fimbria on edge (finger-like projections)
      - captures the newly ovulated oocyte

2. ----------------------
   a. Middle section
   b. Site of fertilization

HYPOTHALAMUS

Secretion:

Usually peptides that regulate release of hormones from the pituitary

Type: Peptide

Action:

Release of Luteinizing hormone and Follicle stimulating hormone
ANTEOR PITUITARY

Secretion:

Proteins and glycoproteins that regulate many functions of the body including ovaries and testis

Six very important hormones !!

1) **Luteinizing hormone (LH)** - Glycoprotein

Target: Gonads, follicles, Leydig cells

- Spermatogenesis and oogenesis
- Maintenance of the CL function
- Estrogen and testosterone synthesis

Follicle stimulating hormone (FSH) from the anterior pituitary stimulates follicular development at the ovary (Courtesy of Select Sires)
Ovulation occurs on day 1 of the estrous cycle
(Courtesy of Select Sires)

ANTERIOR PITUITARY Cont.

2) Follicle stimulating hormone - Glycoprotein
Target: gonads, follicles, Sertoli cells

✓ Spermatogenesis and oogenesis
✓ -----------------------------------------------
✓ Control of steroids synthesis by the ovary and testis
**POSTERIOR PITUITARY**

**Secretion:**

**Peptides:** Oxytocin and Anti Diuretic Hormone (ADH)

**Origin:** Hypothalamus

Stored and secreted from the posterior pituitary

**Oxytocin:** also secreted by the CL

**Target:** Endo- and myometrium, mammary gland

- Prostaglandin synthesis
- Milk ejection

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**1) Estradiol (E₂)**

**Target:** Hypothalamus, Repro. Tract, mammary gland

**Source:** Follicles (Granulosa cells), placenta

- Control of GnRH secretion
- Mammary alveoli development
Increasing levels of estrogen produced by the dominant follicle enter the bloodstream of the cow, inducing estrus behaviors (Courtesy of Select Sires)

1) Progesterone (P₄)

Target: Hypothalamus
Repro. Tract (uterine glands)
mammary gland

Source: Corpus luteum placenta

- Inhibits Sexual behavior (estrus/heat)
- Control of GnRH and LH secretion
- Mammary alveoli and duct development
Progestosterone (P4)  
Estradiol (E2)  

Progestosterone produced by the corpus luteum has a quiescent effect on the uterus (Courtesy of Select Sires)
**Uterus (Endometrium)**

Prostaglandin F2α  
Target: Hypothalamus  
Somatic tubule  
Accessory sex glands  

Source: Uterine endometrium, Vesicular glands

- In male: affects sperm metabolism

In Female  
- Control of estrous cycle and-----------------------------  
- Communicates with the ovary as to presence of embryo  
- Determines the life of the-----------------------------

Prostaglandins produced by the uterus initiate  
luteal regression in non-pregnant cows (Courtesy of Select Sires)
Progesterone blocks the hypothalamic production of GnRH, ultimately blocking FSH release from the pituitary (Courtesy of Select Sires)

The developing embryo blocks the production of prostaglandins and preventing luteal regression (Courtesy of Select Sires)
Estrous Cycle

- Divided into two phases
  1) Follicular phase (2-3 days)
     - First period of follicular growth and regression of previous CL
     - Estrus (12-18 hours)
       - Period where female is receptive to male
  2) Luteal Phase (17-19 days)
     - Early, Mid and Late Lutea phase
     - No expression of heat, CL develops and progesterone increases
Fig 24-12. The bovine estrous cycle averages 21 days, with day 0 representing the period of standing heat, or estrus (Courtesy of Select Sires)

Fig 24-14. During the follicular phase of the estrous cycle, progesterone levels are low and estrogen levels are high (Courtesy of Select Sires)
Mating and Fertilization

• During Estrus cows are receptive to Bulls and therefore can be mated or artificially inseminated.

Only a small percentage of sperm initially ejaculated by the bull will find their way through the cervix to the uterus (Courtesy of Select Sires)
During artificial insemination, a smaller number of sperm are deposited directly in the uterus (Select Sires)

The first event in sperm capacitation, hyperactive motility, primarily occurs in the oviduct (Courtesy of Select Sires)
During transport, sperm adhere and release from the oviductal epithelium (Courtesy of Select Sires)

Within 12 hours of insemination, sperm are distributed throughout the oviduct and are ready to fertilize the ova (Courtesy of Select Sires)
Cells in the oviduct are ciliated to facilitate ova transport and prevent oviductal implantation (Courtesy of Select Sires)

Fig 24-13. The estrous cycle is comprised of a luteal phase and a follicular phase, each of which has distinct hormonal profiles (Courtesy of Select Sires)
During the luteal phase of the estrous cycle, progesterone levels remain high and estrogen levels are much lower (Courtesy of Select Sires)

Embryo development

Distinct cavity

Morula Mulberry!

Blastocyst

Flushing & embryo recovery

Figure 13-1
Development of the Yolk sac

Fusion of the trophoblast with endoderm and development of chorion

Regression of the Yolk sac and expansion of allantois

Fusion of chorion membrane, development of Amnion sac, development of placental membrane