

Animal and Veterinary Science Department
University of Idaho

AVS 222 (Instructor Dr. Amin Ahmadzadeh)

CHAPTER 2

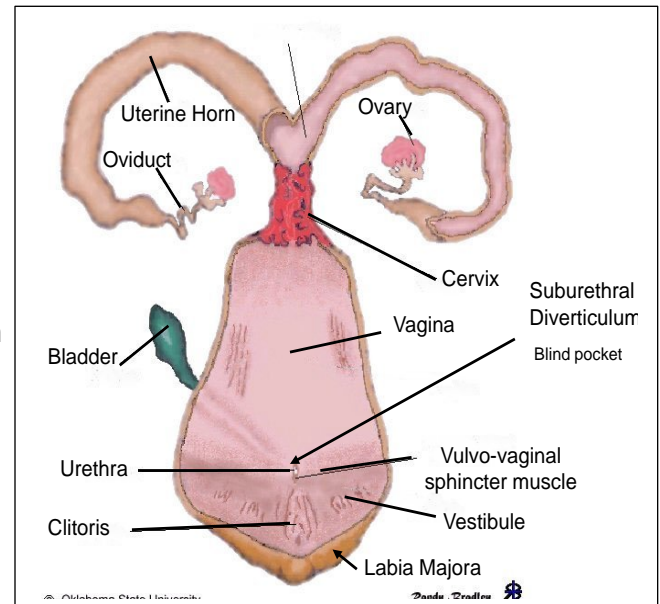
FEMALE REPRODUCTIVE ANATOMY (PART I)

General Functions of the Female Reproductive Tract

- Produce oocytes
- Transport sperm
- Facilitate fertilization
- Provide environment for embryo and fetus
- Give birth to fetus
- Recycle to become pregnant again
- Provide nutrients to young

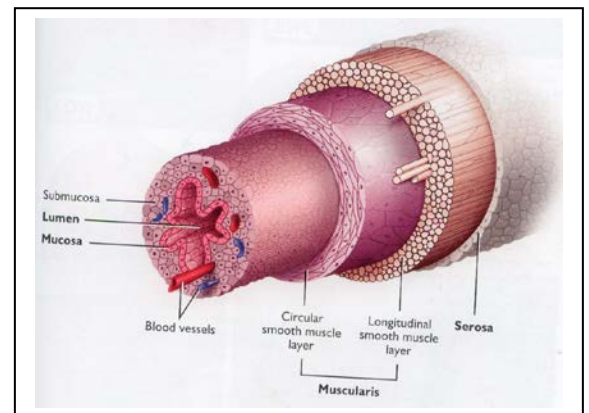
Supportive Tissues: BROAD LIGAMENT

- A. Supports Reproductive Tract in Abdomen
- B. Three Parts:
 1. Mesovarium — supports ovary
 2. Mesosalpinx — supports oviduct
 3. Mesometrium — supports uterus (uterine body & horns)



Three Layers of the Female Reproductive Tract

- 1) Tunica serosa (**Perimetrium**)
 - a. Outermost layer
 - b. Connective tissue
- 2) Tunica muscularis (**Myometrium**)
- 3) Tunica mucosa (**Endometrium**)
 - a. Consists of mucosa and submucosa



I. EXTERNAL GENITALIA (Figures 2-23 and 2-24)

- A. Vulva (Consists of two **labia**, which form commissures)
 1. Labia minora
 - a. Inner folds

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- b. Homologous to sheath
 - c. Small in farm animals
 - 2. Labia majora
 - a. Outer folds
 - b. Homologous to scrotum
 - c. Externally visible
- B. Clitoris
 - 1. Homologous to penis
 - 2. Large in mare
 - 3. Highly innervated by nerve endings
 - 4. Highly sensitized area
 - 5. Stimulation may contribute to conception rates in cattle when cows inseminated artificially

II. POSTERIOR (CAUDAL) VAGINA (Figures 2-22, 2-5, 2-7, and 2-9)

Histology

- 1. Stratified squamous epithelium

Function/Structure

- 1. Region common to reproductive & urinary systems
- 3. Stimulates male for copulation (Not present in humans)
- 4. Passage for fetus during parturition

Components

- 1. Hymen — embryonic remnant
 - a. Mullerian duct — reproductive tract
 - b. Urogenital sinus — vestibule
- 2. External urethral orifice — opening of urethra
- 3. Suburethral diverticulum — blind pocket (sow & cow)
 - a. Helps block urine from entering uterus
- 4. Vestibular glands
 - a. Bartholin's glands (Pair of glands located in vestibule wall)
 - i. Secrete during estrus
 - ii. Lubricate vagina

***Posterior vagina has no or limited glands, low degree of mucus secretion and epithelial thickness changes with the stage of the estrous cycle.**

III. ANTERIOR (CRANIAL) VAGINA (Figures 2-22, 2-5, 2-7, and 2-9)

Histology

1. Simple columnar epithelium (different from caudal vagina) (**Fig. 2-22**)

A. Female Copulatory Organ

1. Site of semen deposition — cow, ewe, doe, human
3. Luminal epithelium (near the cervix) is secretory (mucus)
4. pH is acidic (5.7) – Bacteriostatic
5. Stimulates glans penis of the bull

B. Structure

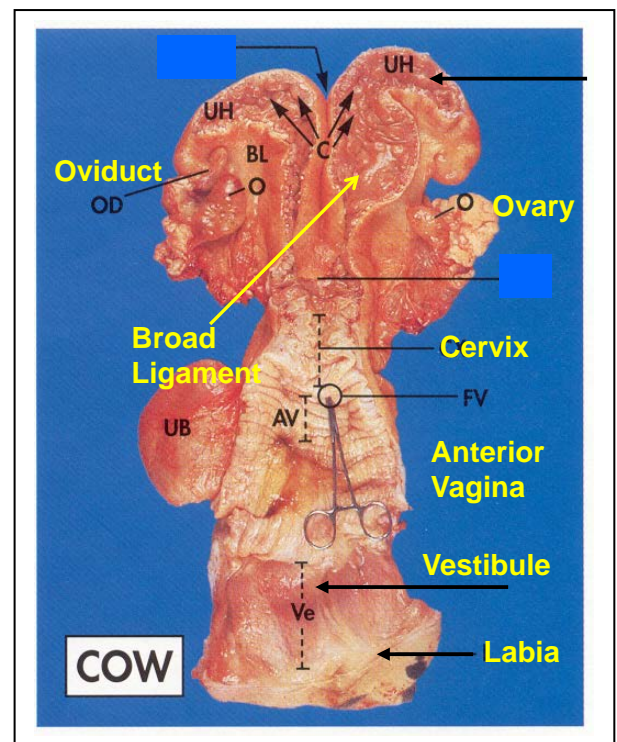
1. Length
 - a. Cow = 35-30 cm
 - b. Ewe, doe, sow = 10-15 cm
2. Outer layer
 - a. Tunica serosa
3. Middle layer
 - a. Circular muscle
 - b. Longitudinal muscle
4. Inner mucosal muscle
 - a. Stratified squamous epithelium

C. Mucosa Responds to Hormones

1. High estradiol
 - a. Epithelial cell growth
 - b. Cornified (dead) cells — lack a nucleus
 - c. Increase in leukocytes (WBC)
 - d. Estrus detection in rodents

D. Contains a large crypt (pocket) called the fornix vagina

*Fornix vagina is absent in the sow and mare



Adapted from Senger ©

IV. CERVIX (Figures 2-20, 2-21)

Histology

1. Simple columnar epithelium

A. Structure

1. Technically part of the uterus
2. Thick-walled & inelastic
3. Anterior portion continuous with uterus
4. Fornix -- blind sac formed by cervix protruding into vagina
5. Histology
 - a. Tunica serosa — outer layer
 - b. Middle layer — mostly connective tissue; some smooth muscle
 - c. Inner layer — secretory epithelium secretes mucus; few ciliated cells

B. Types of cervix:

1. Annular rings
 - a. Found in cow, ewe, doe — act to seal uterus
 - (1) cow: 3-4 rings
 - (2) doe: 5 rings
 - (3) ewes: 6-7 rings
2. Interdigitating prominences
 - a. Found in the sow — accommodates a corkscrew-shaped penis in the boar
3. Longitudinal folds
 - a. Found in the mare — softens during copulation

B. Functions

1. Isolates the uterus from the external environment (acts as barrier)
 - b. Cervical mucus — flows into vagina
 - c. Cilia — beat toward vagina
2. Passage for sperm
 - a. Sows & mares — site of sperm deposition
 - b. Sperm reservoir

- i. sperm held in cervix
 - ii. sperm long lived in cervix
 - iii. provides slow sperm release — increases chance of fertilization
 - c. Sperm selection — heterologous inseminations
 - d. Mucus and anatomy of cervix act as a sperm filter in some species
 - *Prevents large numbers of sperm from reaching oviduct in cow and ewe
 - 3. Responsible for isolation of the conceptus (fetus) within uterus from external environment
 - a. Cervical plug (cervical seal)
 - i. formed during pregnancy
 - ii. formed from mucus
 - ii. liquifies at parturition
- C. Cervical Mucus
- 1. Properties:
 - a. Biochemical and physical properties of the mucus changes during the estrous cycle
 - b. Hormones change properties:
 - i. high progesterone — thick, viscous mucus
 - ii. high estradiol — thin, watery mucus
 - 2. Lubricant at parturition
 - a. Cervix expands due to fetal pressure

V. UTERUS (Figures 2-7 to 2-9, 2-16, and 2-17)

Histology

- 1. Simple columnar

Divided into Two Parts

- 1. Uterine horns (2)
 - a. Size varies with uterine type
 - b. Cow, ewe, sow, doe — 80-90% of total length
 - c. Small in horses

- d. Absent in humans
 - e. Bifurcation – point where uterine horns split from uterine body
2. Uterine body
 - a. Area common to both sides of female tract

Structure

1. Perimetrium (tunica serosa)
 - Outer serous layer continuous with peritoneum - blocks adhesions
 - a. Outermost layer
 - b. Connective tissue
2. Myometrium (tunica muscularis)
 - a. Middle layer of muscle
 - b. Contains 3 layers:
 - i. Two outer layers longitudinal muscle
 - ii. One inner layer circular muscle
3. Endometrium (tunica mucosa)
 - a. Provides point of placental attachment and glands provide secretions for embryo development (estradiol and progesterone)
 - b. Innermost layer
 - c. Highly secretory
 - d. Simple secretory glands

Functions

- a. Nourish the embryo -- secretes histotrophe or uterine milk
 - b. Site of implantation (Figure 2-17)
 - i. Exchange with maternal system through the uterine wall
(placentome)
 - c. Sperm transport
 1. Primarily muscular contraction
 2. Sperm move faster than can swim
- D. Expulsion of the fetus and fetal placenta
1. Muscles of myometrium contract during parturition
 2. Responsiveness of myometrium varies with hormonal state
- E. Control of estrous cycle and luteolysis

1. Communicates with the ovary about presence of embryo -- determines the life of the *corpus luteum*

- a. Secretion of prostaglandin $F2\alpha$ in the absence of the fetus to regress the corpus luteum

Types of Uteri (Figure 2-15)

A. Duplex

1. In rat, rabbit, guinea pig
2. Have 2 cervixes — one for each horn
3. No embryo migration possible

B. Bicornuate

1. In cow, ewe, sow, doe
2. Large uterine horns
3. Small uterine body
4. In cows, ewes, & does — external fusion makes body appear large

C. Bipartite

1. In horse
2. Small uterine horns
3. Large uterine body

D. Simple

1. In humans and primates
2. Large, pear-shaped uterine body
3. Non-existent horns