ANSC 630: INFORMATION CARD

• NAME
• MAJOR
• ADVISOR
• RESEARCH INTERESTS
• PREVIOUS COURSES:
  – Reproductive Biology
  – Biochemistry
  – Physiology
  – Histology
  – Embryology
OVERVIEW OF FUNCTIONAL REPRODUCTIVE ANATOMY: THE MAJOR COMPONENTS

**Figure 3-14.** Endocrine-neuroendocrine relationship among hypothalamus, pituitary gland, and gonad (ovary-testis). Hypothalamic neurosecretory materials (GnRH) are transported by the portal blood capillaries to the cells of the anterior pituitary. FSH and LH stimulate the gonads. Estrogens and androgens secreted by the gonads exert a feedback.
Hypothalamus

Mammillary body

Median eminence

Optic chiasm

Infundibulum

Anterior pituitary

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<th>Pars tuberalis</th>
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<td>Pars intermedia</td>
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<td>Pars distalis</td>
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Posterior pituitary

Infundibular stalk

Pars nervosa

Hypophyseal fossa in sella turcica of sphenoid bone
Hypothalamic Neurons
Supraoptic
Paraventricular

Axons

POSTERIOR PITUITARY (PARS NERVOSA)
Oxytocin - Neurophysin
Vasopressin-Neurophysin

Hypothalamic Neurons
Melanocyte Stimulating Hormone Releasing Factor

Nerve Tracts

INTERMEDIATE LOBE OF PITUITARY
Melanocyte Stimulating Hormone (MSH)
Hormone Profile of the Estrous Cycle in the Ewe

- GnRH (pg/ml)
- Estradiol
- LH
- FSH
- Progesterone
- PGF$_{2\alpha}$
Development of the Hypophysis
Neurons

- **Cell body (soma; perikaryon) – Synthesis of neuropeptides**

- **Cellular processes**
  - Dendrites
  - Axon - Transport
  - Terminals – Storage and Secretion

- **Peptide neurotransmitter synthesis**
  - Transcription – Gene transcribes mRNA
  - Translation – mRNA translated for protein synthesis
  - Maturation – post-translational processing
  - Storage in vesicles - Hormone secreted from vesicles

Yen 2004 Reprod Endocrinol 3-73
Hypothalamus

• Mid-central base of brain
  – Optic chiasma
  – 3rd ventricle
  – Mammillary body

• Nuclei
  – Clusters of neurons
    • Different functions & stimuli for hormone secretion
  – Secrete peptide hormones
    • Control pituitary activity
    • Vascular connections
    • Neural connections
Figure 5-3. The anatomy of the typical mammalian hypothalamus and pituitary. The hypothalamus is a specialized ventral portion of the brain consisting of groups of nerve cell bodies called hypothalamic nuclei, which appear as lobules in the figure. The surge center, the tonic center and the paraventricular nucleus (PVN) have direct influence on reproduction. The anterior and posterior pituitary are positioned in a depression of the sphenoid bone called the sella turcica. The right panel (frontal view) illustrates the relationship of the paraventricular nucleus (PVN), the surge center and the tonic center to the third ventricle and pituitary. The vertical line in the left panel (sagittal view) represents the plane of section shown in the right panel. Notice that the third ventricle, a brain cavity, separates the lateral portions of the hypothalamus. AP = Anterior Pituitary, PP = Posterior Pituitary, OC = Optic Chiasm. (Graphic by Sonja Oei.)
• Vascular connection to Anterior Pituitary
  – Hypothalamo-hypophyseal portal system
    • Axons to capillaries in pituitary stalk where GnRH and Dopamine is released

• Blood to AP
  – Superior Hypophyseal Artery (SHA)
  – Primary Portal Plexus (PPP)
  – Secondary Portal Plexus (SPP)

– GnRH – releases LH and FSH
– Dopamine – Prolactin Inhibiting Factor
Hypothalamohypophyseal Portal Vasculature

- Hypophysiotropic peptidergic or aminergic neurons terminate adjacent to the primary capillaries of the infundibulum (3, 5) or adjacent to the capillaries of the short portal vessels (2).

- Neurohypophyseal neurons project to the neurohypophysis and secrete neurohormones into the sinusoids of the neurohypophysis.
Hypothalamohypophyseal Portal Vasculature

- Blood supply – Internal carotid artery
- Superior hypophyseal artery (rostral)
- Inferior hypophyseal artery (caudal) – infundibulum and neurohypophysis
- Anterior hypophyseal artery (trabecular artery; mediorostral)
Hypothalamic Regulation of Anterior Pituitary Hormones

- Gonadotropin Releasing Hormone – GnRH
- Corticotrophin Releasing Hormone – CRH
- Thyrotrophin Releasing Hormone – TRH
- Growth Hormone Releasing Hormone – GHRH
- Growth Hormone Inhibiting Factor - Somatostatin
- Prolactin Inhibiting Factor – Dopamine
- Prolactin Stimulating Factors - oxytocin,
Preoptic Area and Hypothalamus

INPUTS
Light:Dark Ratio
Smell
Nutritional Status
Sight
Stress
Neurotransmitters
Neurotransmitters/Neurohormones

- Amino acid derivatives
  - Cathecholamines: dopamine, norepinephrine, epinephrine
  - Derived from phenylalanine and tyrosine

![Chemical structures showing the biosynthesis of catecholamines](image-url)

Lovejoy 2005; Neuroendocrinology 119-148
Hypothalamus
GnRH, PIF, GHRH, CRH, TRH

Hyphothalamo-Hypophyseal Portal System

ANTERIOR PITUITARY GLAND

GONADOTROPHS
Follicle Stimulating Hormone (FSH)
Luteinizing Hormone (LH)

LACTOTROPHS
Prolactin (PRL)

SOMATOTROPHS
Growth Hormone (GH)

THYROTROPHS
Thyroid Stimulating Hormone (TSH)

CORTICOTROPHS
Adrenocorticotrophin Stimulating Hormone (ACTH)
Pituitary

- Anterior Lobe
- Adenohypophysis
- Pars distalis
  - Endoectoderm origin
  - Produces
    - FSH
    - LH
    - PRL
    - GH
    - ACTH
    - TSH

- Posterior Lobe
- Neurohypophysis
- Pars nervosa
  - Neuroectoderm origin
  - Stores and releases
    - Vassopressin
    - Oxytocin

- Intermediate Lobe
- Pars intermedia
  - Neuroectoderm origin
Hypothalamic Neurons
Supraoptic
Paraventricular

Axons

POSTERIOR PITUITARY
(PARS NERVOSA)
Oxytocin - Neurophysin
Vasopressin-Neurophysin

Hypothalamic Neurons
Melanocyte Stimulating Hormone Releasing Factor

Nerve Tracts

INTERMEDIATE LOBE OF PITUITARY
Melanocyte Stimulating Hormone (MSH)
• Neural Supply to PP
  – **Supraoptic nucleus**
    • Vassopressin-Neurophysin I
  – **Paraventricular nucleus**
    • Oxytocin-Neurophysin I
  – **Neurophysins**
    ➢ Chaperone peptide forms complex with oxytocin and neurophysin
    ➢ Hormone-Neurophysin Complex Transported via axons to Nerve Terminals in the Posterior Pituitary Gland
  – **Neural stalk**
    ➢ Axons release Oxytocin + Neurophysin I or Vassopressin + Neurophysin I into capillaries draining Posterior Pituitary
Neuro-Endocrine Reflex

- Nerve pathway from supraoptic nuclei and paraventricular nuclei of hypothalamus.
- Neurohypophysis releases oxytocin into the blood.
- Teat stimulation triggers milk ejection from myoepithelial cells (smooth muscle).
- Alveoli produce milk.
Pineal Gland (epiphysis)

- Photoreceptor in amphibians

- Endocrine gland in mammals
  - Influenced by light and season
  - Secretes melatonin
    - Melatonin Influences GnRH secretion
      - Long-day breeders - Horse
      - Short-day breeders - Sheep
Female Reproductive Anatomy

- Ovaries
- Oviducts
- Uterus
- Cervix
- Vagina
- Vestibule
- Vulva
- Clitoris
Figure 2-7. Caudal view of the cow, ewe, sow and mare (mare with permission from Ginther, O.J; see additional reading) reproductive tracts in situ. Intestines have been removed so that the reproductive tract is in full view. The tract is suspended by the broad ligament (BL) which is attached dorsally and is continuous with the peritoneum. BL = Broad Ligament; IC = Intercornual Ligament; O = Ovary; OD = Oviduct; R = Rectum; RgP = Recto-genital Pouch; UH = Uterine Horn.

2-1. The reproductive organs in the ruminant (cow as an example), sow and mare as seen from mid-sagittal. Note the relationship of the tract to the rectum. Modified from Ellenberger and Baum (1943). Handbuch der echten Anatomie der Haustiere, 18th Edition. Zietzschmann, Ackerknecht and Grum, eds. Permission from J. Verlag, New York.
Female Reproductive Anatomy

- Ovaries
- Oviducts
- Uterus
- Cervix
- Vagina
- Vestibule
- Vulva
- Clitoris
Ovarian Architecture

- **Cortex** – outer zone
  - Covered by germinal epithelium
- **Medulla** – inner zone
  - Loose connective tissue
  - Stroma continuous with stroma of mesovarium at hilus

most species  
equine
**Ovarian Cycle**

1. **Primordial Follicle:**
   - Has unilamellar structure
   - Contains a *primary oocyte*
   - Approximately size 20-50 µm

2. **Early Primary Follicle:**
   - Has multilamellar structure
   - Has a zona pellucida
   - Contains a *primary oocyte*
   - Approximately size 45 µm

3. **Secondary Follicle:**
   - Has an antrum
   - Contains a *primary oocyte*
   - Approximately size 125-150 µm

4. **Mature (Graafian) Follicle:**
   - Contains a *primary oocyte* (approximate size 125-150 µm)
   - Until hours before ovulation
   - When meiosis I is completed
   - Presence of first polar body indicates *secondary oocyte*

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**Cytoplasmic Changes**

- Corpus luteum
- Corpus albicans
- Ovulation
Theca cells
Mural Granulosa Cells
Cumulus Oopherus (cumulus granulosa cells)
Corona Radiata
Follicular Fluid
Zona Pellucida
Oocyte With Nucleus
Mural Granulosa Cells
Basement Membrane

[Diagram of ovarian follicle with labeled parts: Theca cells, Mural Granulosa Cells, Cumulus Oopherus (cumulus granulosa cells), Corona Radiata, Follicular Fluid, Zona Pellucida, Oocyte With Nucleus, Mural Granulosa Cells, Basement Membrane]
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GDF, growth differentiation factor 9

BMP, bone morphogenetic protein

AA – amino acid

SCF, stem cell factor

LH-R, LHCGR, luteinizing hormone receptor
OVARY

• Functions
  – Gametogenesis – ovum, ova
  – Steroidogenesis – estrogen, progesterone
• Round, almond- or bean-shaped
  – Depends on species
• Paired
  – Most species, completely surrounded by a thin membrane, the *infundibulum*, which is a part of the *oviduct*.
• Suspended
  – caudal to kidneys in sublumbar region by the *mesovarium* (part of the *broad ligament* supporting the entire reproductive system)
Ovarian Histology

- **Germinal epithelium**
  - simple squamous or low cuboidal
    - covers free surface of ovary
    - basement membrane absent

- **Tunica albuginea**
  - dense layer of connective tissue beneath the germinal epithelium
Ovarian Histology

• **Primordial follicles**
  – immediately beneath the tunica albuginea
  – lacks a membrane
  – separated from adjacent interstitial tissue by a single layer of follicular (granulosa) cells

• **Primary follicles**
  – lifetime supply at birth
  – remain at this stage until puberty
  – most never ovulate, but undergo atresia
Ovarian Histology

**Secondary follicles**
- growing follicles
- increase in number of layers of granulosa cells
- Zona pellucida

**Tertiary follicles**
- maturing follicles
- antrum formation
  - fluid filled space
- oocyte on mound of granulosa
  - Cumulus oophorus
- granulosa layer immediately around oocyte
  - Corona radiata
- Granulosa surrounded by
  - Theca interna
  - Theca externa
MATURE GRAAFIAN FOLLICLE

Follicular Fluid

Theca cells

Zona Pellucida

Oocyte With Nucleus

Mural Granulosa Cells

Basement Membrane

Corona Radiata

Cumulus Oopherus (cumulus granulosa cells)
Ovarian Histology

- **Mature Graafian Follicle**
  - Same structures as tertiary follicle, but larger
    - Layers of cells & volume of follicular fluid is greater
    - Stigma-like structure forms on surface of follicle to ovulate
    - Size of Ovulatory Follicle
      - **Cow**
        - 15-20 mm
      - **Mare**
        - 25-70 mm
      - **Bitch, ewe, doe, sow**
        - 5-10 mm
Ovarian Histology

- **Corpus hemorrhagicum (CH)/Corpora hemorrhagica**
  - newly ruptured follicle
  - essentially a blood clot

- **Corpus luteum (CL)/Corpora lutea**
  - LH stimulates formation from theca interna and granulosa
  - temporary endocrine gland
    - progesterone

- **Corpus albicans (CA)/Corpora albicantia**
  - remains after CL regresses
Figure 2-6. Schematic illustration of the ovary showing the primary structures and their sequence of development. It should be noted that, in general, all types of follicles are present within the ovary at any point in time. However, developing and functional corpora lutea may or may not be present depending on the stage of the estrous cycle. With the exception of the mare, development (and regression) of all ovarian structures occurs at random locations within the ovary. (Graphic by Sonya Oel.)
Ovulatory Surge of Luteinizing Hormone

Primates
Structural Changes During Luteinization
Two Cell Theory for Ovarian Sex Steroid Production

- **THECA CELLS**: Cholesterol to Progestins (Pregnenolone and Progesterone and 17-alpha hydroxy progestins) to androgens (testosterone and dehydroepiandrosterone)

- **GRANULOSA CELLS**: Androgens to Estrogens VIA AROMATASE ENZYME

- **LUTEAL CELLS** – Cholesterol to Progesterone
Steroidogenesis Before LH Surge

A: Antrum; GL: Granulosas; BM: Basement Memb
TI: Theca Int. TE: T Ext.; C: Capillaries

Ch: Cholesterol; P: Progesterone; A$_2$: Androgen; E$_2$: Estradiol

FSH

P450scc

3$\beta$-HSD

Arom

LH

P450scc

3$\beta$-HSD

17$\alpha$-HSD
Luteal Steroidogenesis

Ch: Cholesterol; P: Progesterone; A_2: Endrogen; E_2: Estradiol
Endocrine Effects of Progesterone

- Inhibits LH and FSH Secretion
- Contraction and Secretion
- Differentiation and Secretion
- Lobuloalveolar Development

PROGESTERONE - the HORMONE of PREGNANCY!
Figure 8-4. Changes in hormones during the follicular phase. As progesterone ($P_4$) drops, FSH and LH increase together in response to GnRH. FSH and LH cause the production of estradiol (E$_2$) by ovarian follicles (Figure 8-2). When the follicle reaches a certain maturational stage, it produces inhibin, which suppresses FSH secretion from the anterior pituitary. Thus, FSH does not surge with the same magnitude as LH. When estrogen reaches a threshold level (peak), the preovulatory surge of LH occurs, inducing ovulation.
Duration of Luteal Function Across Species

Weeks

Days/Weeks

Weeks

Months

Physiological Review 79:263
Tubular Female Reproductive Tract

- Oviducts, uterus, cervix, vagina & vestibule
- Common basic structure
  - Four concentric layers
    - Serosa
    - Muscularis
    - Submucosa
    - Mucosa
Female Reproductive Tract

- Suspended in abdominal cavity by a fold of peritoneal lining
  - Broad Ligament: supports vessels, lymphatics & nerves to each part of tract
    - Mesovarium
      - Attaches to ovary at hilus
    - Mesosalpinx
      - Supports oviduct
    - Mesometrium
      - Supports uterus
Figure 2-6. Embryonic development of the broad ligament. Initially, the uterine horns develop dorsal to the peritoneum (A). As the development continues, (UH = Uterine Horn; R = Rectum), it pushes into the body cavity (arrows in B) and eventually becomes completely surrounded by a layer of peritoneum (C). The broad ligament consists of two layers of peritoneum which "sandwiches" the tract between them (B and C). Each layer of peritoneum is continuous with the peritoneal lining of the body cavity. (Graphic by Sonja Oei.)
Figure 2-7. Caudal view of the cow, ewe, sow and mare (mare with permission from Ginther, O.J.; see additional reading) reproductive tracts in situ. Intestines have been removed so that the reproductive tract is in full view. The tract is suspended by the broad ligament (BL) which is attached dorsally and is continuous with the peritoneum. BL = Broad Ligament; IC = Intercornual Ligament; O = Ovary; OD = Oviduct; R = Rectum; RgP = Rectogenital Pouch; UH = Uterine Horn.

2-1. The reproductive organs in the ruminant (cow as an example), sow and mare as seen from mid sagittal. Note the relationship of the tract to the rectum. Modified from Ellenberger and Baur (1943), Handbuch der Tieren Anatomie der Haustiere, 18th Edition, Zietzhmann, Ackerknecht and Grau, eds. Permission from r-Verlag, New York.
Oviduct or Fallopian Tube

- Supported by mesosalpinx
  - Open pouch or bursa for ovary; differs among species
- Functions
  - Ovum transport
  - Sperm storage & capacitation
  - Fertilization
  - Embryonic development
- Ciliated epithelial cells
  - Transport
- Nonciliated epithelial cells
  - Secretory
Oviductal Anatomy

- **Infundibulum**
  - Funnel-shaped proximal end
  - Fimbriae
  - Captures ova

- **Ampulla**
  - Ovum transport

- **Ampullary-Isthmic Junction**
  - Site of fertilization

- **Isthmus**
  - Sperm reservoir
  - Early embryonic development
Figure 2-10. Relationship of the mesosalpinx to the oviduct in the cow, ewe, sow and mare. The infundibulum is a delicate membrane-like component of the oviduct, which is in close apposition to the ovary. Arrows indicate the direction of oocyte/embryo transport within the oviduct toward the uterus.

AF = Antral Follicle
CA = Corpus Albicans
If = Infundibulum
Ms = Mesosalpinx
O = Ovary
OD = Oviduct
UH = Uterine Horn
UOL = Utero-Ovarian Ligament
UL = Uterine Lumen
Oviductal Secretory Proteins

- Organ specific
- Region specific
- Cycle specific
  - Quantitative & qualitative differences
- Interaction with
  - Ova
  - Embryos
  - Spermatozoa
- Growth factors
Tubo-uterine Junction

• Valve-like structure
• Regulates passage of
  – Embryos to uterus
  – Spermatozoa to oviduct
  – Other substances: block to entry into the oviduct
• Area of accumulation of sperm for movement into the oviduct
Uterine Histoarchitecture

R.D. Geisert
& L. Burdett
Functions of the Uterus

• Primary functions
  – Sperm transport to oviducts
  – Luteolysis & control of cyclicity
  – Development of the conceptus
  – Maternal contribution to placenta
  – Expulsion of fetus and fetal placenta
Uterus

- **Unique nomenclature**
  - Serosa = perimetrium
  - Muscularis = myometrium
  - Mucosa + submucosa = endometrium
    - Lumenal Epithelium
    - Superficial Glandular Epithelium
    - Glandular Epithelium

- **Most species have two uterine horns (cornua)**
  - Classification based on degree of development of uterine body
Uterine Classification

• Duplex
  – marsupials, lagomorphs, rodents
  – 2 cervixes, 2 separate horns, no uterine body
  – Facilitates multi-sire and multi-treatment experiments

• Bicornate (cow/ewe/mare)/Bipartite (sow)
  – Moderate fusion (bipartite)
  – cow, ewe, doe, mare
    • 1 cervix, 2 uterine horns, 1 uterine body
  – Minimal fusion
  – sow, bitch, queen
    • 1 cervix, 2 uterine horns, 1 short uterine body

• Simplex
  – primates
  – 1 cervix, no uterine horns, prominent body
Subprimate vs Primate Mammals: Distinctions Regarding Tubal Pregnancy and Regulation of Lifespan of the Corpus Luteum (CL)

• Primates
  – Tubal Pregnancy
  – Uterine Independent Menstrual Cycles

• Subprimates
  – No Tubal Pregnancy
  – Uterine Dependent Estrous Cycles
Endometrium

- **Mucosa + submucosa**
  - Epithelia
    - Lumenal
  - Endometrial Glands
    - Glandular Epithelia
    - Superficial Glandular Epithelium
  - Blood vessels
  - Lymphatics
  - Stroma
    - Stratum Compactum
    - Stratum Spongiosum
Uterine Gland Life Cycle in Sheep
Progestins Inhibit Endometrial Adenogenesis
No Glands, No Histotroph, No Pregnancy

Control  UGKO

Acyclic Infertile

Adult Sheep
Comparative Anatomy

• Ruminants
  – Caruncles
    • Devoid of glands
    • Maternal portion of placentome
    • Vascular sites of attachment to Cotyledons – the vascular fetal portion of placentome

• Sow and Mare
  – Endometrial folds

• Primates
  – Very dynamic
  – Cyclic sloughing of endometrium (menstruation)
Human Endometrium

UTERUS: PROLIFERATIVE (FOLLICULAR) PHASE

1. Columnar epithelium
2. Superficial lamina propria
3. Interglandular lamina propria
4. Basal lamina propria
5. Smooth muscle fibers (I.A.)
6. Smooth muscle fibers (I.A.)
7. Arteries
8. Uterine glands (I.A.)
9. Coiled artery
10. Uterine glands (I.A.)
11. Interglandular smooth muscle fibers
12. Intestinal connective tissue
13. Smooth muscle fibers (I.A.)

Stain: hematoxylin-eosin. 45x.
Human Endometrium

- **Secretory Phase**
  - Endometrial thickening
    - Glands
      - ↑ secretory activity
      - ↑ distention
      - ↑ tortuosity
  - Stromal edema
  - Coiled arteries more superficial
Human Endometrium

- **Menstrual Phase**
  - Loss of superficial:
    - Epithelium
    - Glands
    - Stroma
    - Vessels
      - Necrosis
  - Deeper structures intact
Human Endometrium
Uterine Gland Life Cycle in Sheep

Pregnancy

Hyperplasia

Hypertrophy

Involution

Anestrous

Weaning

Parturition

Cycle

Mate

Cyclic

Fetus

Neonate

Birth

Puberty

PND14

PND56

PPD28

PPD1

GD40

GD60

GD120
Uterine Prostaglandins

• Produced by endometrium
  – Arachidonic acid
  – Specific timing for pulsatile PGF release – estradiol and oxytocin
  – Uterine irritation/infection

• Luteolytic
  – Vascular spasm
  – Direct effect on luteal cells

• CL sensitivity
  – Timing
    • Mare, cow, ewe, doe vs sow
  – Dose
    • Sow & ruminants vs mare
    – Vascular anatomy
The Uterus Regulates the Life Span of the Corpus Luteum.
Prostaglandin synthesis by uterine endometrium is released into the uterine vein.

PGF is picked up by the ovarian artery and delivered back to the ovary where it causes lysis of the corpus luteum.
Cervix

- Separates uterus & vagina
- Muscular organ w/constricted lumen
  - Well developed circular muscle
  - Many elastic fibers
  - Highly folded mucosa
  - Mucous cells in epithelium
    - Thick tenacious mucus
    - Cervical plug
  - Species variation
    - Anatomy
    - Physiology
- Seals to protect uterus
- Ferguson Reflex
Figure 2-15. Excised cervical tissue from the cow, ewe, sow and mare. The cervix of the cow and ewe have distinct, well-developed protrusions called cervical rings (CR). The sow has interdigitating prominences (IP). The mare has no cervical rings but has many longitudinal cervical folds (CF) which are continuous with the endometrial folds of the uterus. Arrows indicate the pathway of the cervical canal from the anterior vagina (AV) toward the uterus. AV = Anterior Vagina; CF = Cervical Folds; CR = Cervical Rings; FV = Femoral Vagina; IP = Intercalating Prominences; Ut = Uterus.
Cervix of the Mare

- Dramatic cyclic changes
  - Length
  - Diameter
  - Tone
- No mucous glands
- Simple muscular ring
  - Easily dilated
Vagina & Vestibule

- Female copulatory organ
- Vagina
  - From cervix to hymen
  - Fornix
    - Recess around cervix
    - Absent in sow and bitch
  - Mucosa undergoes cyclic changes
    - Used to stage cycle in bitch
- Vestibule
  - Hymen to vulva
  - Urethral orifice
  - Suburethral diverticulum
    - Cow & sow
Vulva & Clitoris

• **Vulva**
  – Labia
    • Humans
      – Labia minora
      – Labia majora
  – Commissures
  – Two constrictor muscles:
    • Constrictor vulvae
      – Striated
      – posterior
    • Constrictor vestibuli
      – Smooth
      – anterior

• **Clitoris**
  – Homologue of penis
    • Erectile tissue