

Anatomy of Reproductive System

CATTLE / BUFFALO

Biosystems Technology Department
Faculty of Technology

Practical No 1

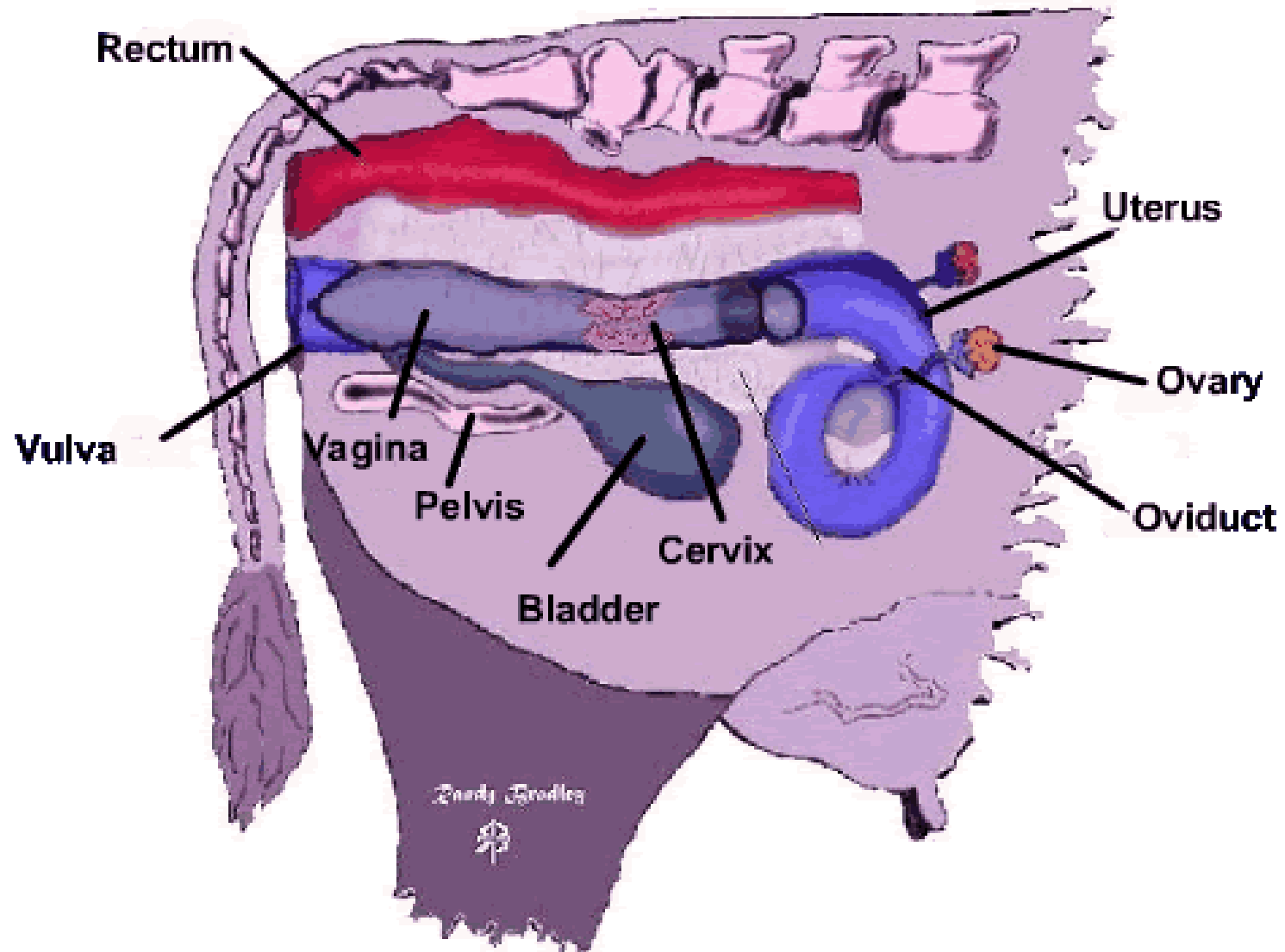
Cow Reproductive System

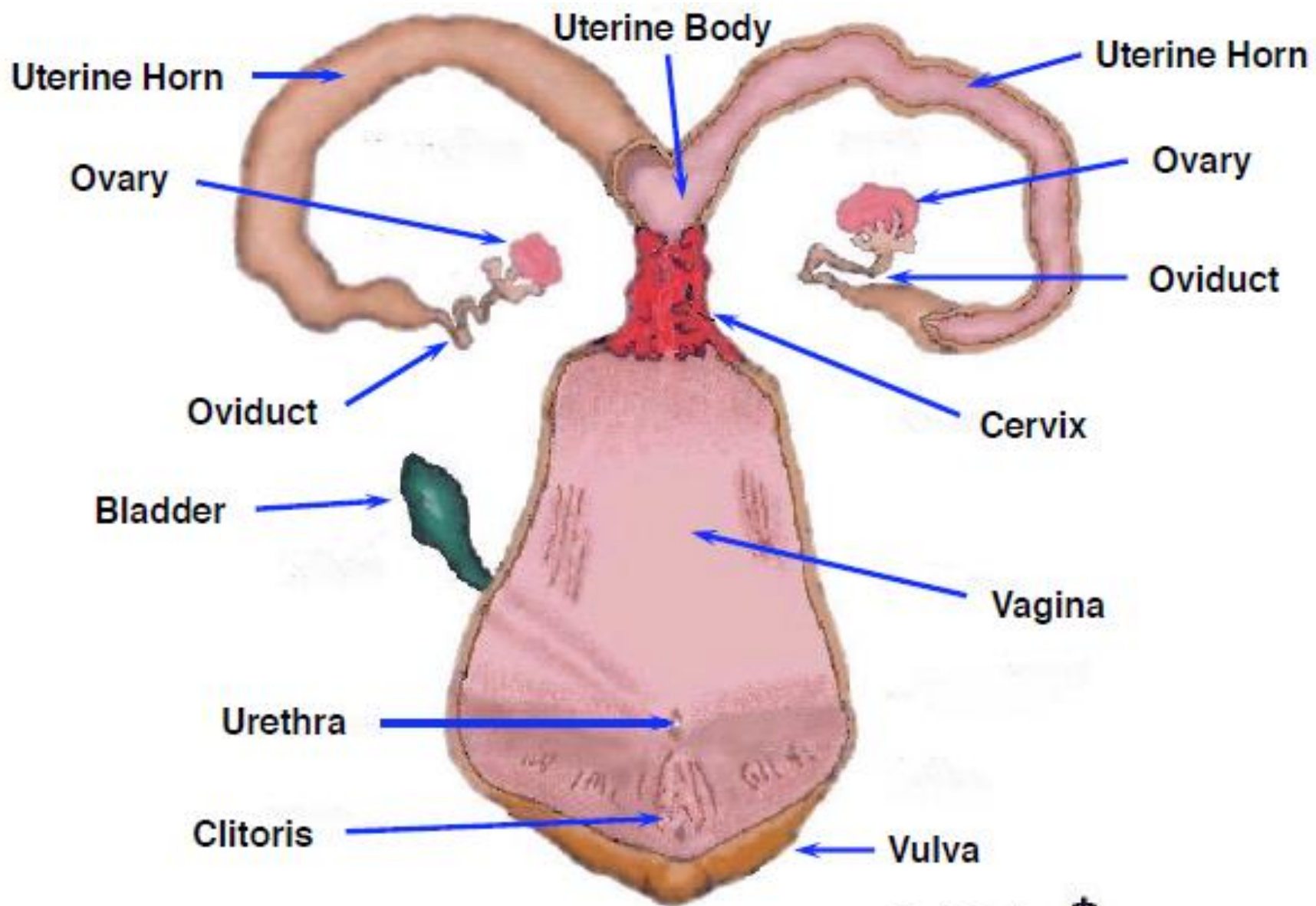
- Cow's reproductive tract consists of all the major components common to the mammals
- Cow's reproductive tract is located below the rectum: manipulation per rectum is possible

Cow Reproductive System

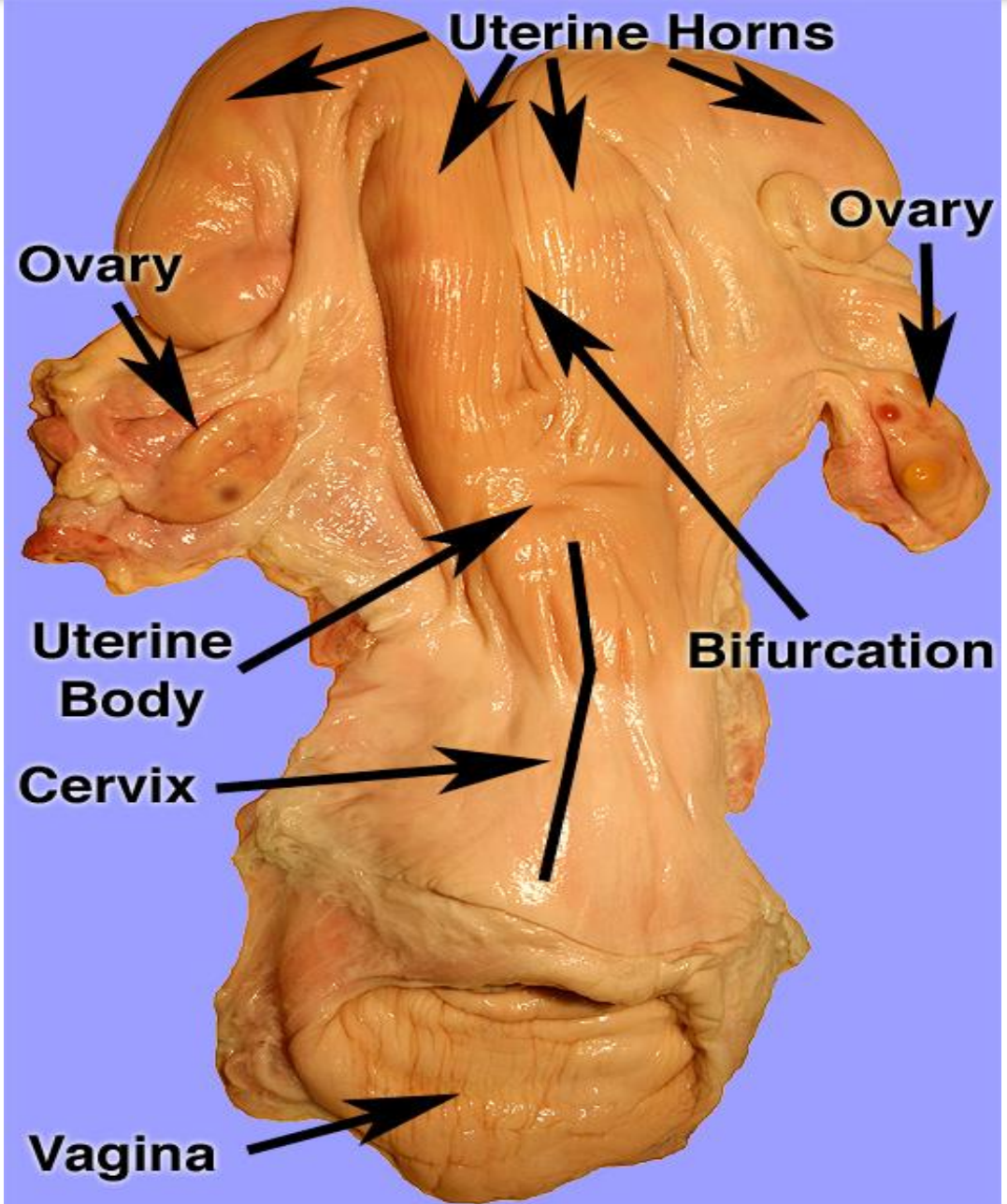
- Main components are:
 1. External genitalia (clitoris, vulva, vestibule, labia majora)
 2. Vagina
 3. Cervix
 4. Uterus
 5. Oviducts
 6. Ovaries

Anatomical Location of the Reproductive Tract of a Cow





Cow's Reproductive Tract



1. External genitalia

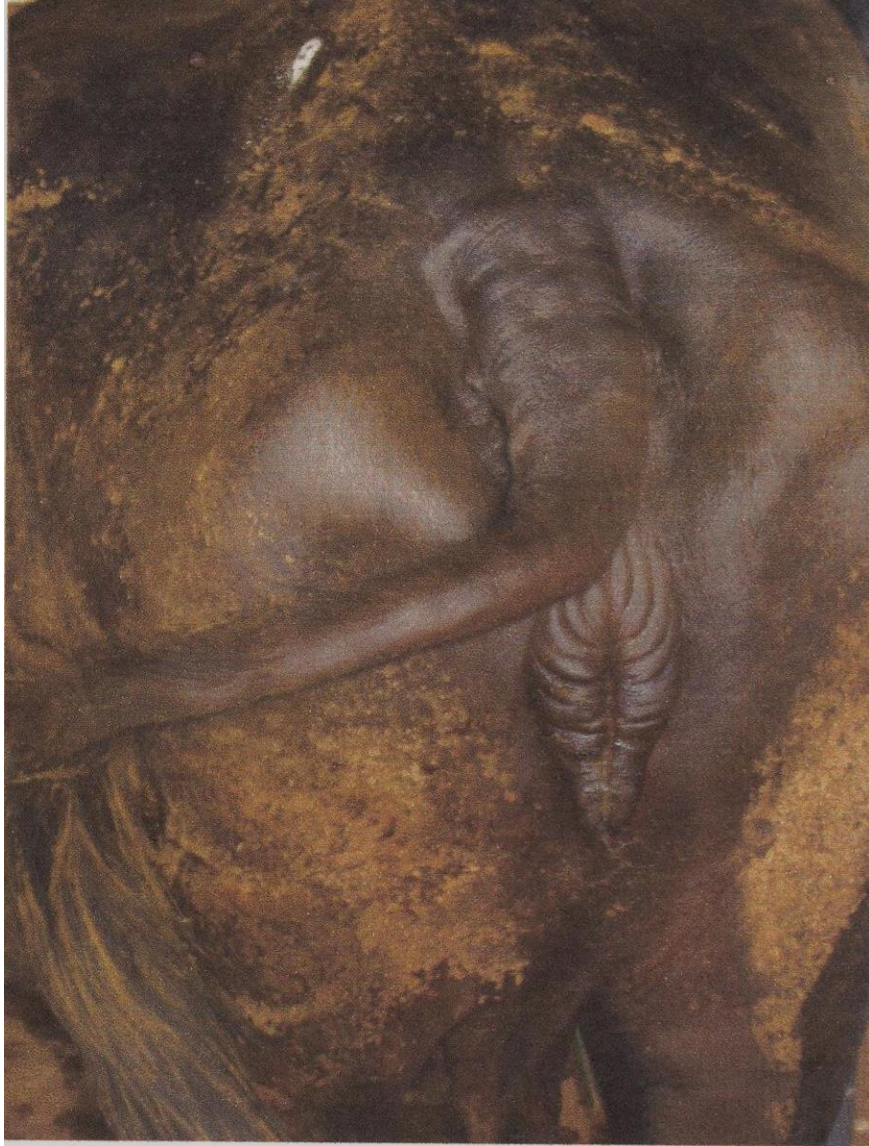
1. Vulva

- Most exterior part of the female reproductive tract.
- Facilitates the reception of penis in copulation
- Can use in heat detection in cows/sows (swollen vulva during standing heat)

2. Labia majora

- Integument has larger number of sebaceous and tubular glands
- Contains fat deposits, elastic tissues and a thin layer of smooth muscles
- Facilitates the reception of the penis during copulation

Swollen Vulva of a Buffalo/ Cow During Standing Heat



1. External genitalia

3. Vestibule

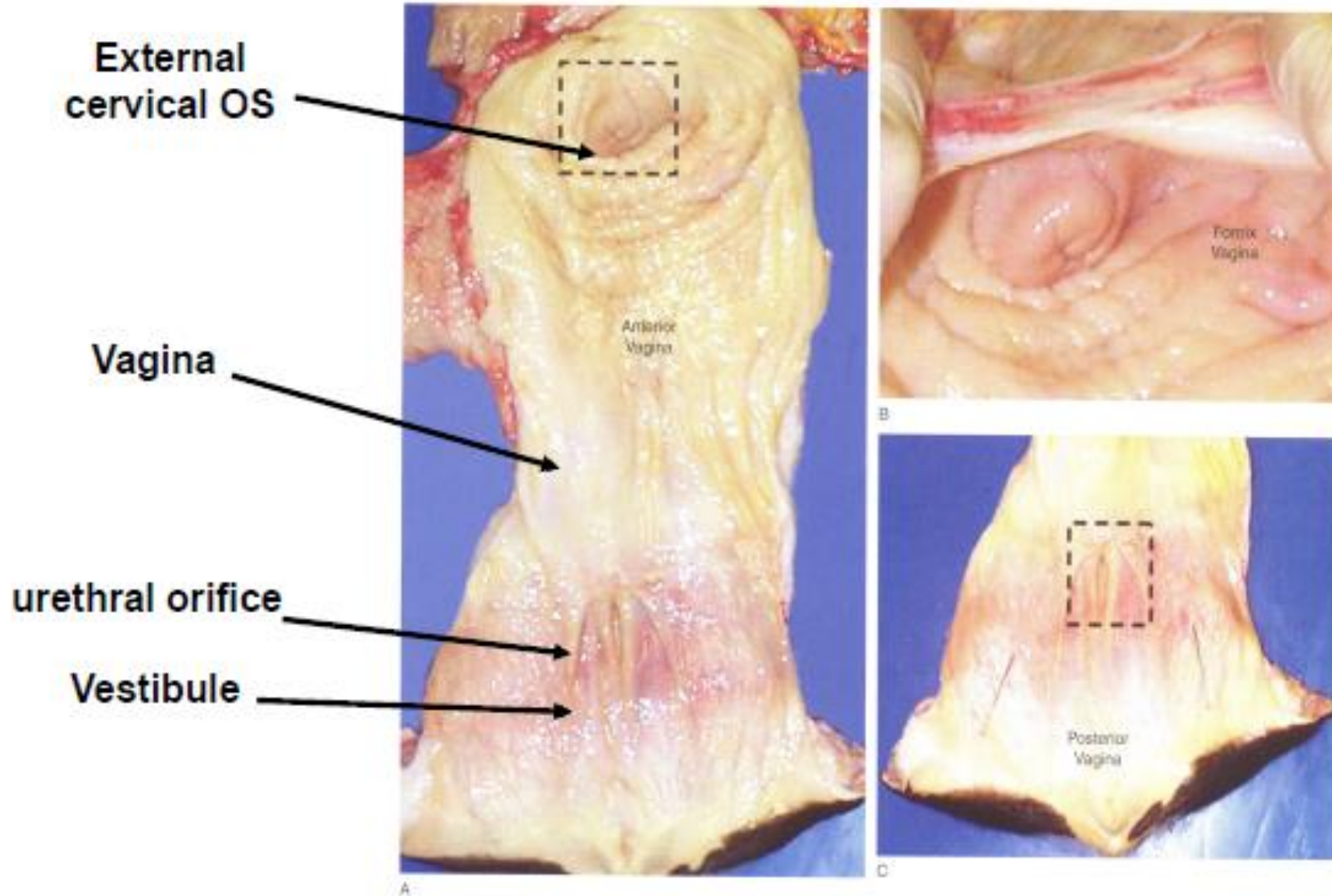
- Posterior part of the vagina
- Extends inward up to 10 cm
- Facilitates the receiving of penis during copulation

4. Clitoris

- Has the embryonic origin of penis
- Well –supplied with sensory nerves
- Increase sexual excitement of female during copulation



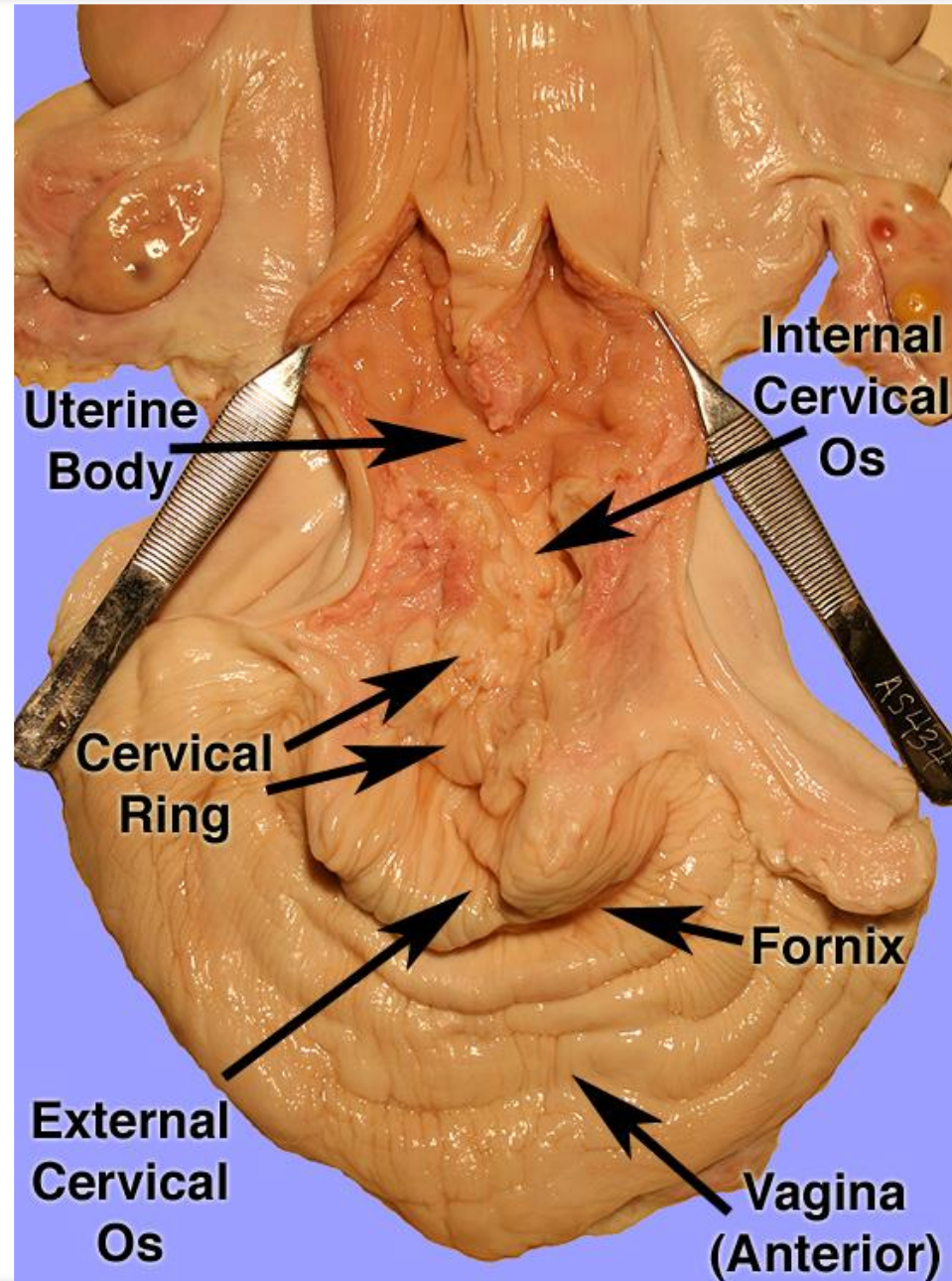
Vagina of Cow

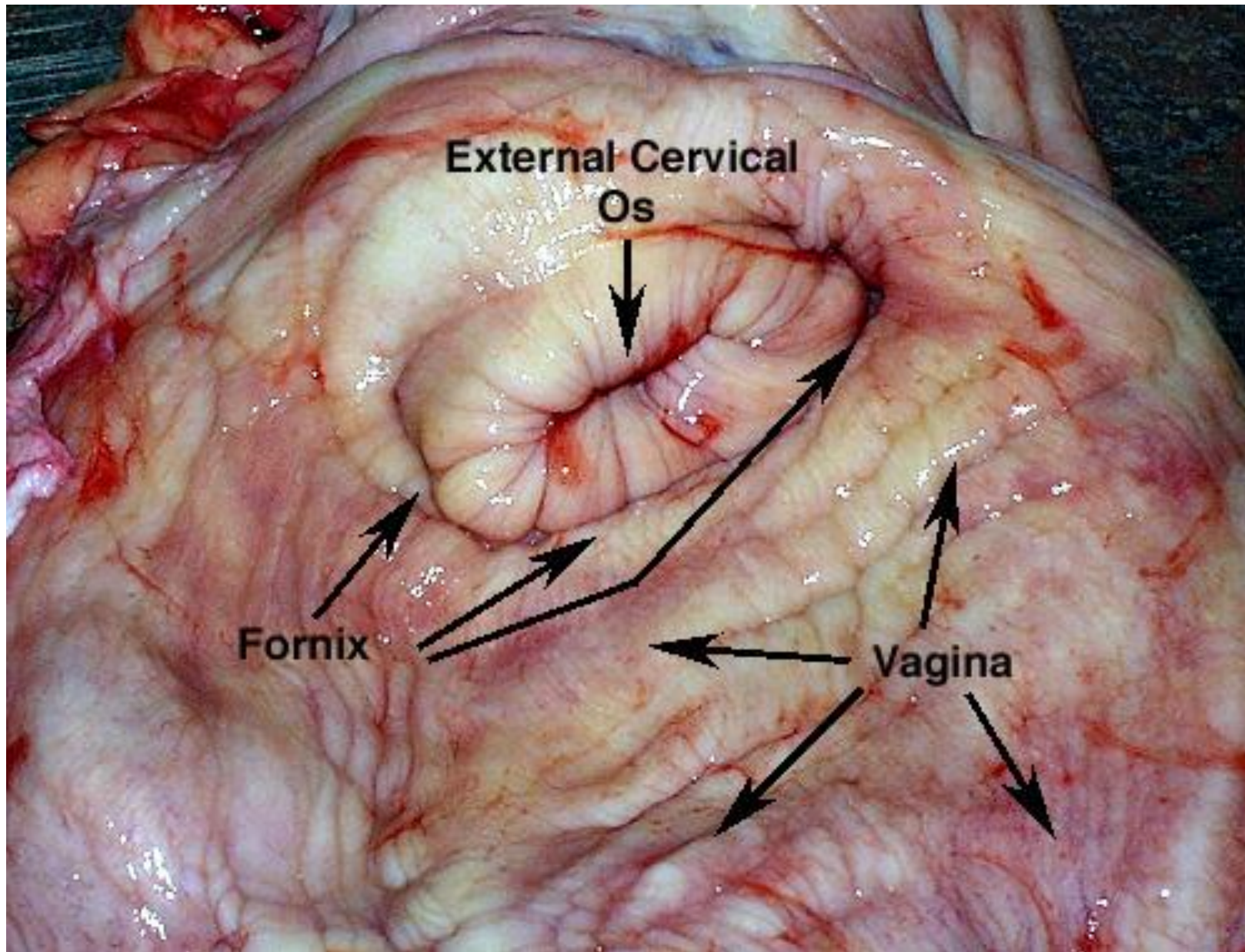


2. Vagina

- It is the main copulatory organ to receive the penis of the bull
- Receives sperm and temporarily store for a short time in the dilated vagina
- Maintains a favourable pH for sperm survival
- Functions as the birth canal during the parturition
- Overall: contraction, expansion, involution, secretion and absorption functions are performed by vagina

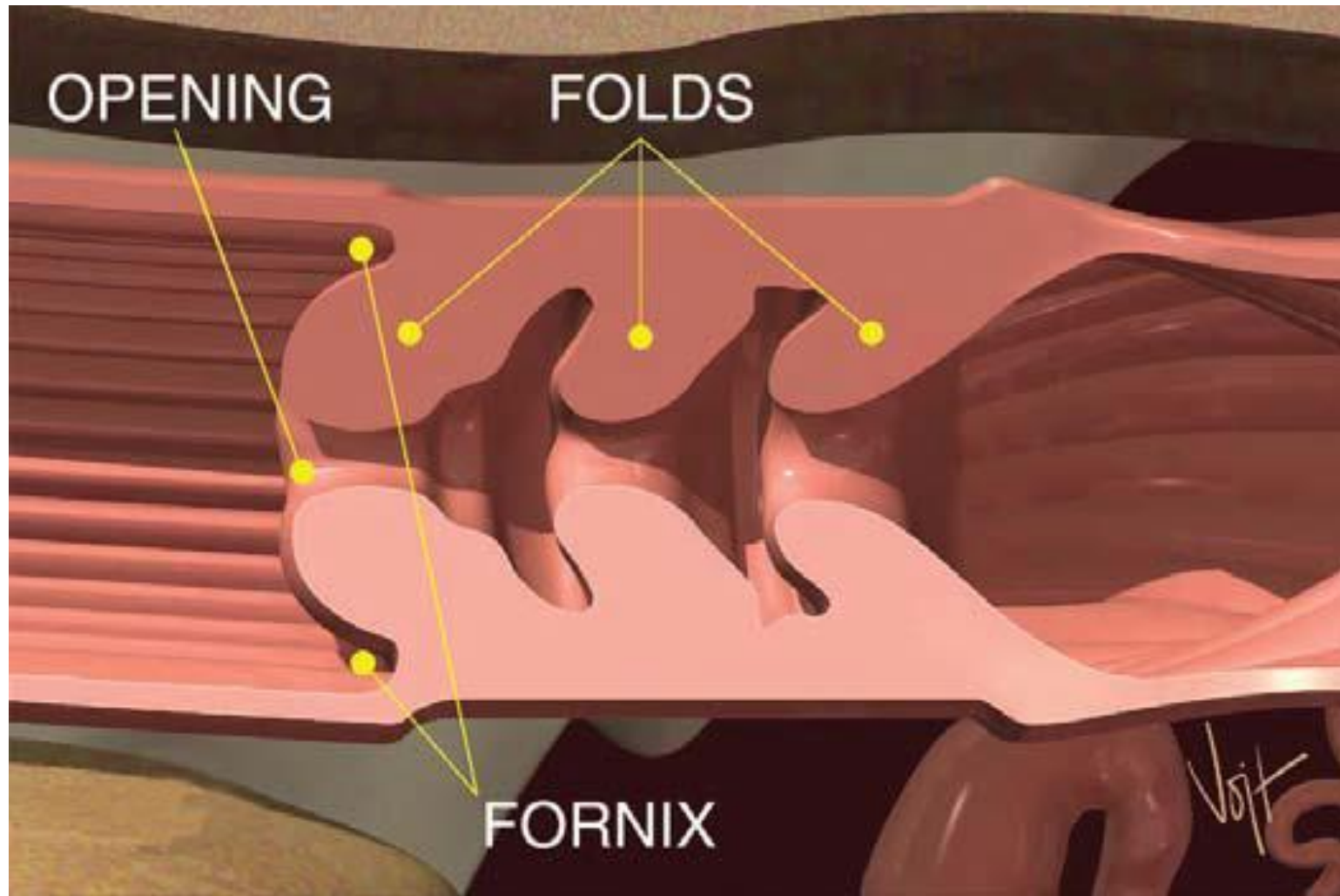
Cervix of Cow





3. Cervix

- Facilitates sperm transportation
- Acts as a sperm reservoir (Fornix)
- May play a role in selecting viable sperm/ sperm selection
- During the pregnancy ,cervical os is closed by thick, turbid mucus preventing the sperm transport, invasion of pathogens and preventing the uterine infections
- The cervical os opens during the parturition



COW

- Cervix is composed of thick connective tissue

Cervix

Cow has 4-5 annular rings

External Cervical Os

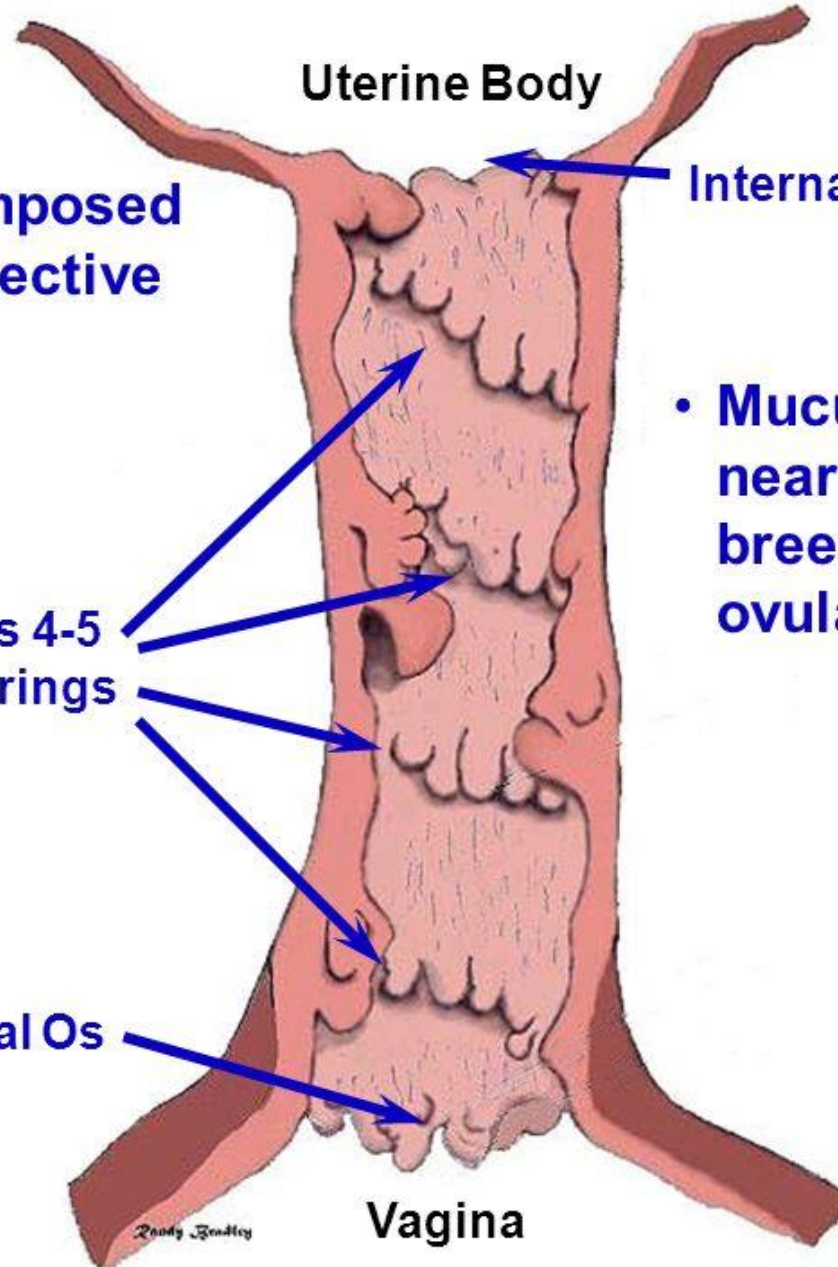
Uterine Body

Internal Cervical Os

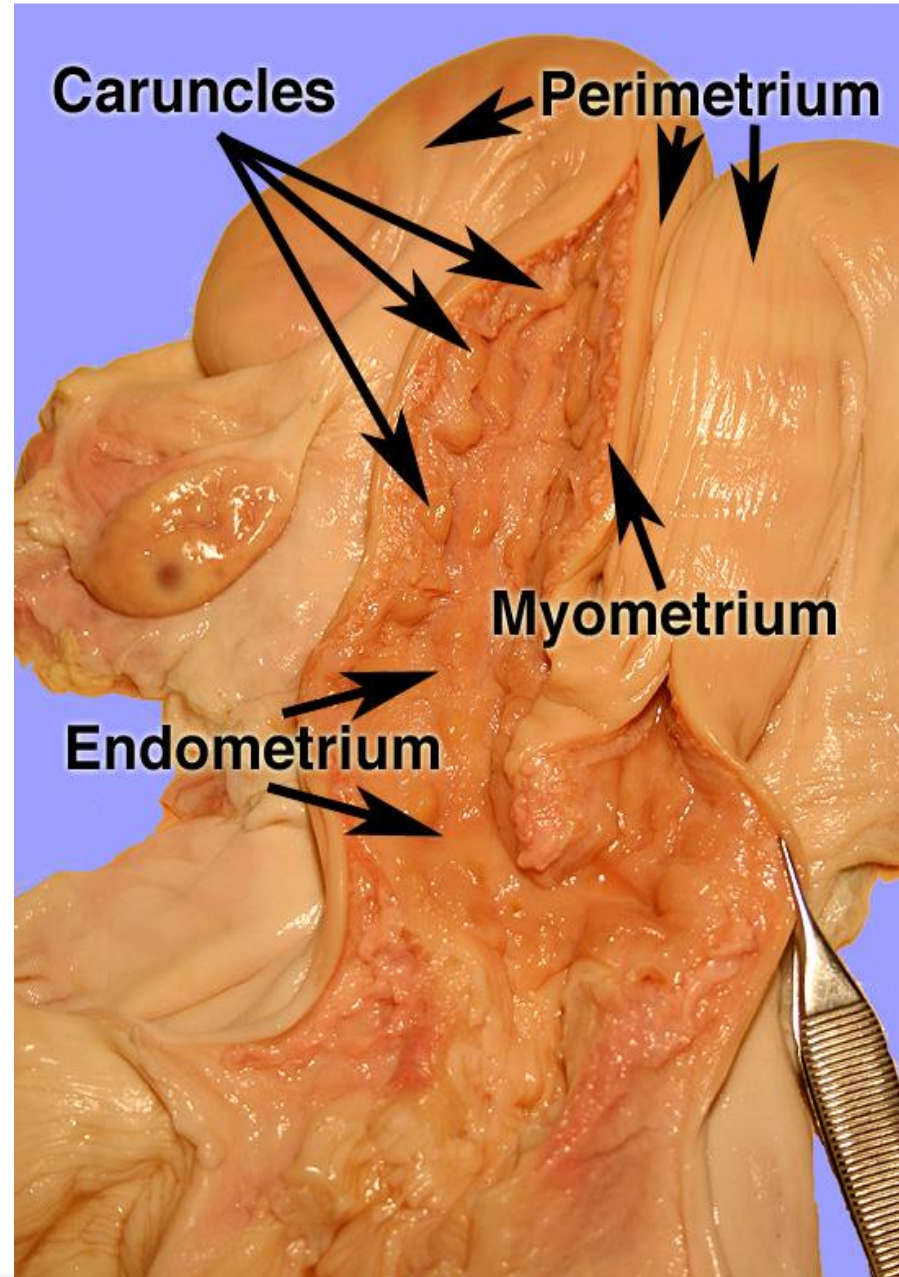
- Mucus is secreted near the time of breeding and ovulation.

Vagina

Randy Goodley



Uterus of Cow



The Uterus

- Consists of two uterine horns and body
- Provides place for fetal development at alter stages of pregnancy
- Horns of uterus - serves as place for embryo to develop into a fetus

Functions of Uterus

Sperm Transportation

- Uterine contractions are essential to transport the sperm from the site of ejaculation to the site of fertilization

Luteolytic mechanism

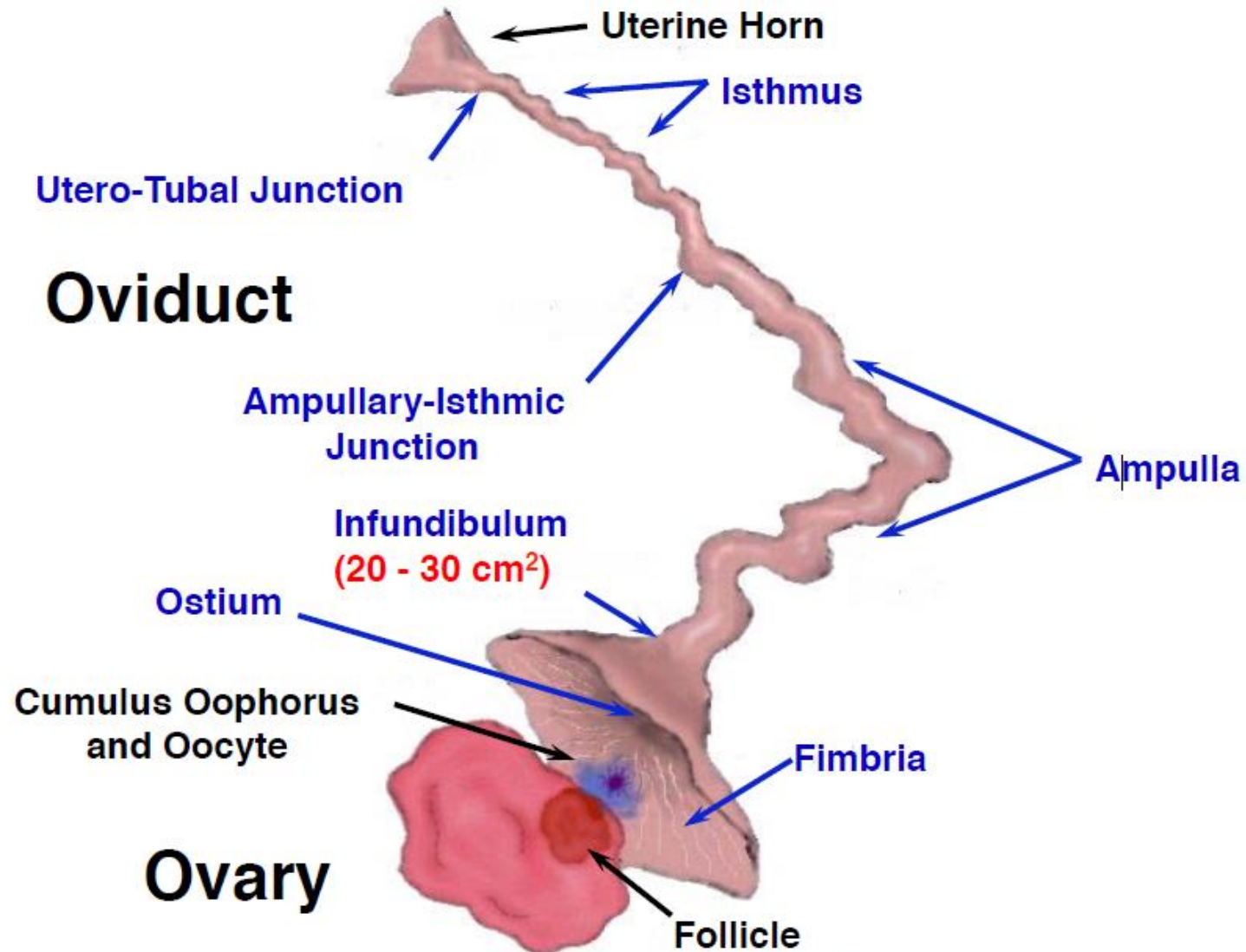
- If pregnancy does not occur, endometrium secrete substances to initiate the regression of the corpus luteum and to start new follicle development

Functions of Uterus

Implantation and Gestation

- Endometrium is the place to implant the developing embryo (blastocyst)
- It also nourishes the embryo
- After implantation , up to the parturition, uterus is the organ which looks after the growing foetus and also uterine contractions help in parturition process as well
- After parturition the uterus will under go “involution” process to get back to normal status

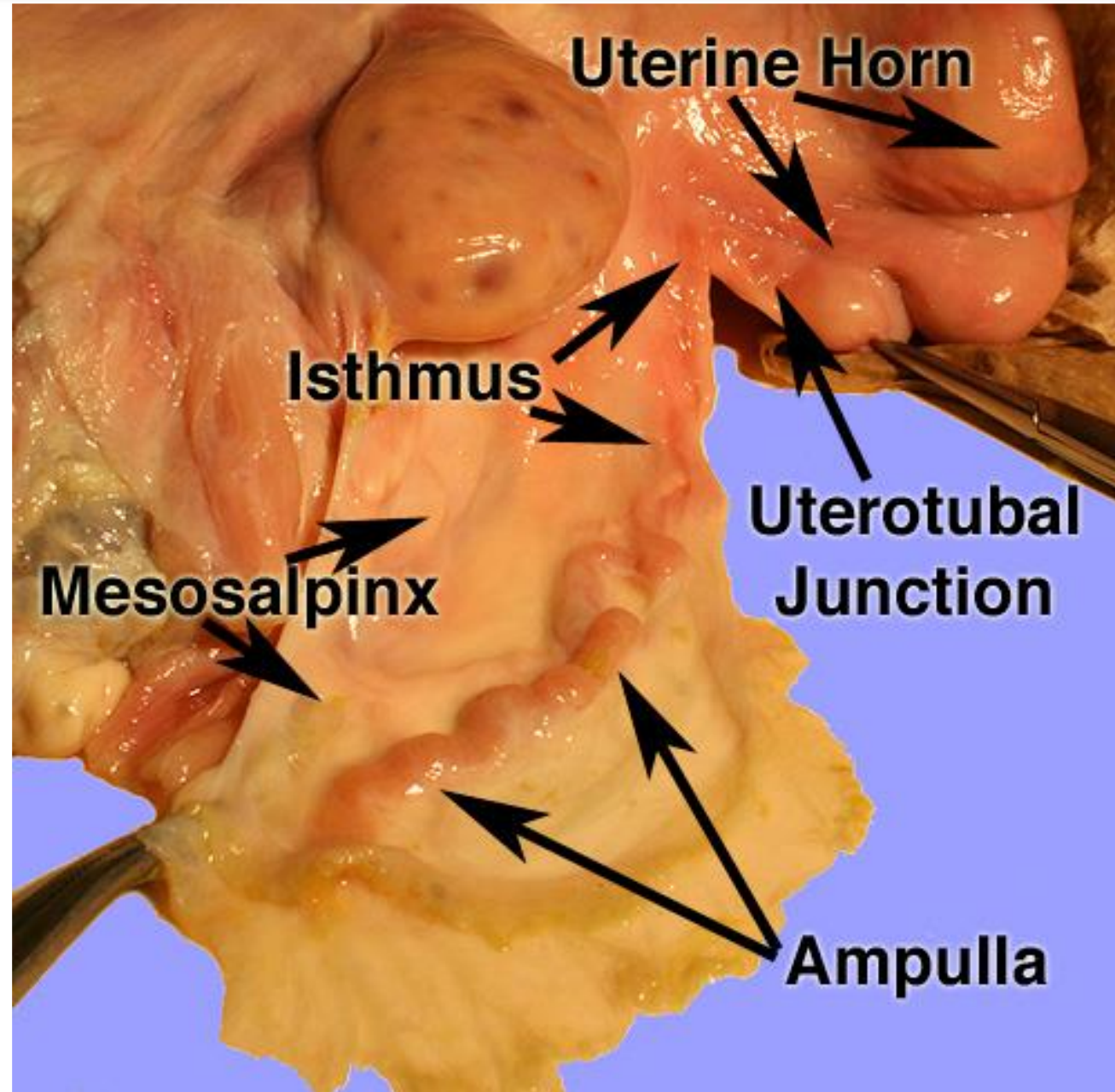
Oviduct and Ovaries of Cow

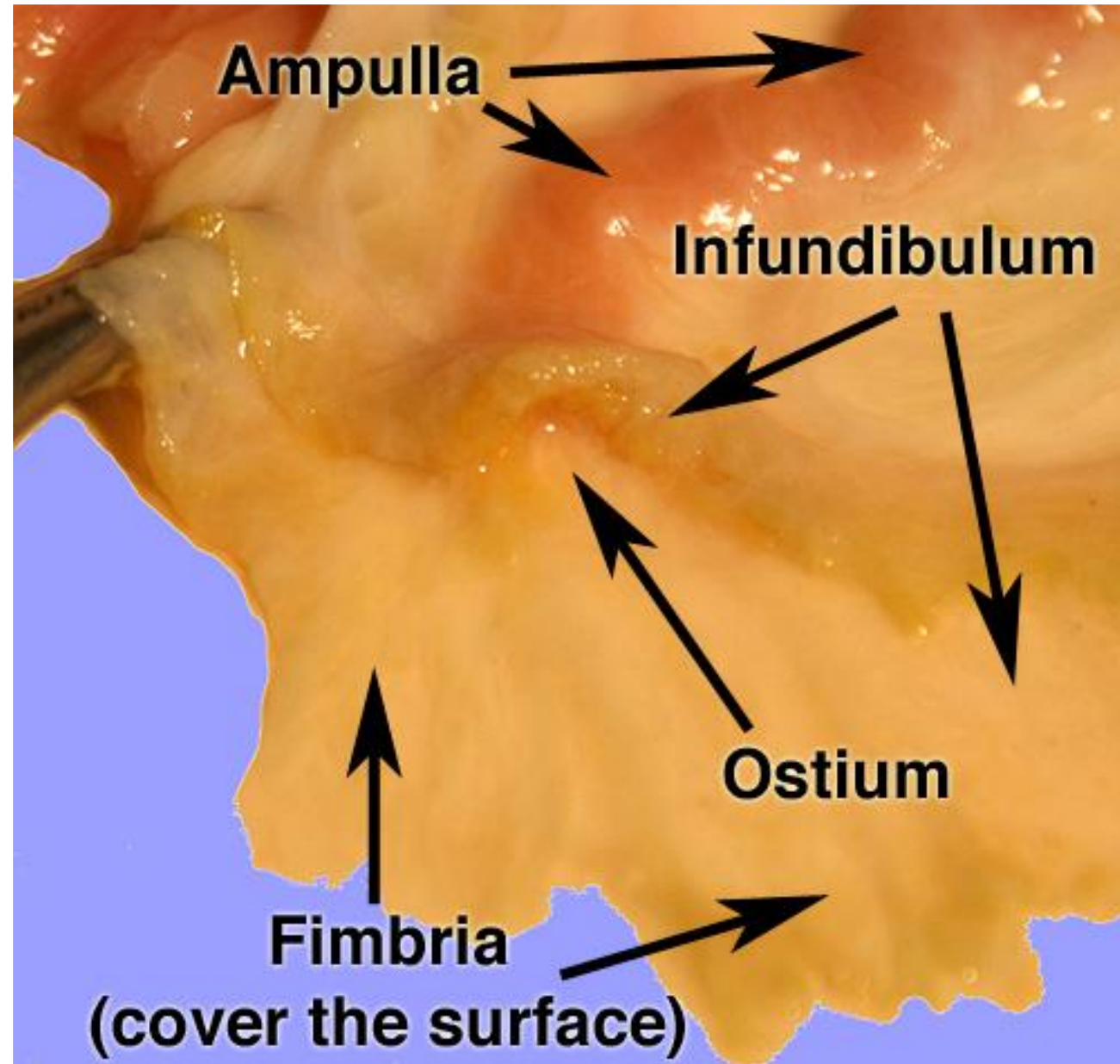


5. The Oviduct (Fallopian tube)

- Long tube like structure
- Connects to the uterus from the utero-tubal junction
- Serves as place where fertilization occurs

Cow's oviduct





Oviduct

Can be divided in to four functional regions

1. Infundibulum

2. Ampulla

3. Fimbriae

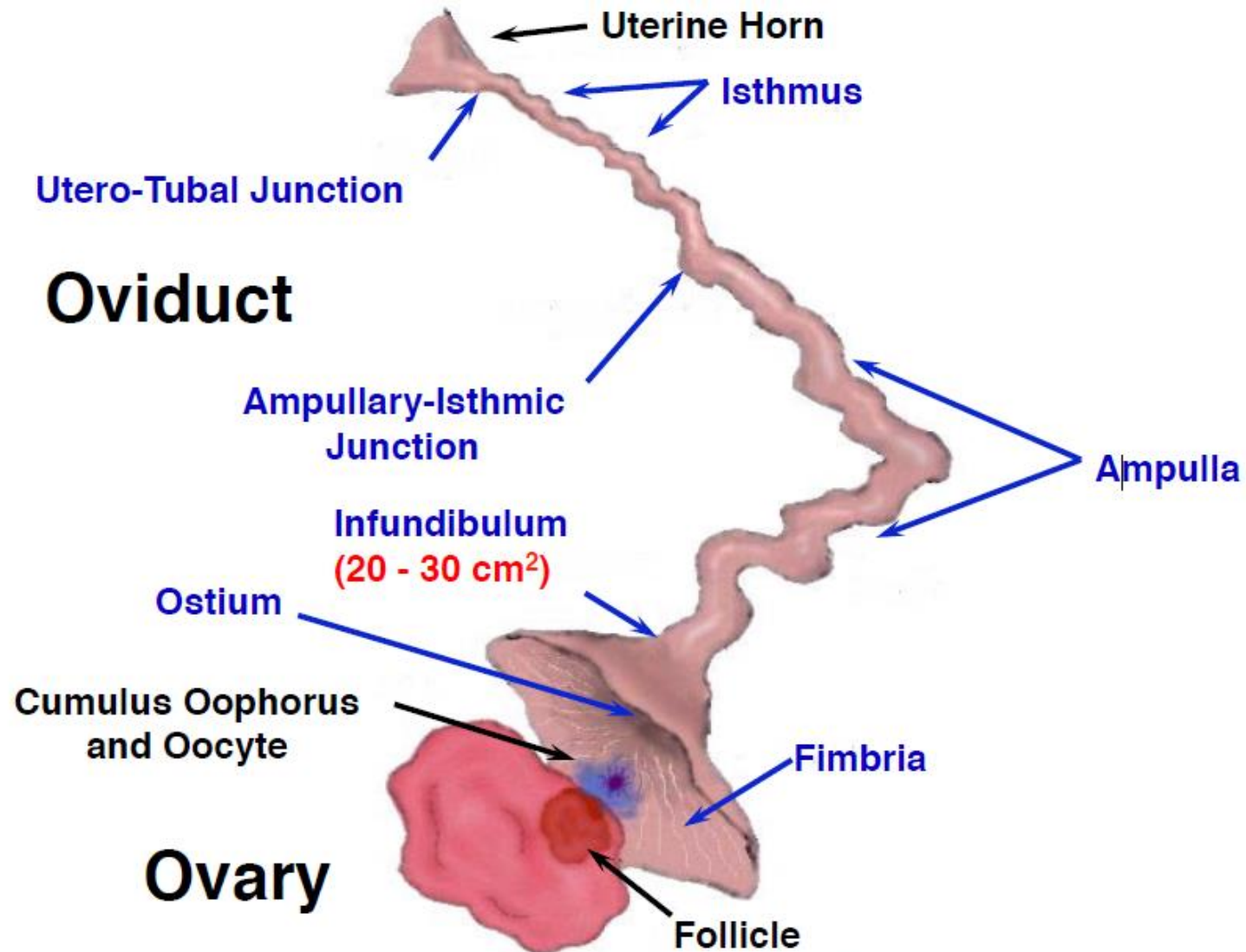
4. Isthmus

Oviduct

1. Infundibulum

- Funnel like structure
- Together with the fimbria, infundibulum finds/ receives the egg
- At ovulation, the ciliated surface of the fimbria and infundibulum "catch" the ovulated egg and transport it to the base of the infundibulum through the ostium and into the ampulla

Oviduct and Ovaries of Cow

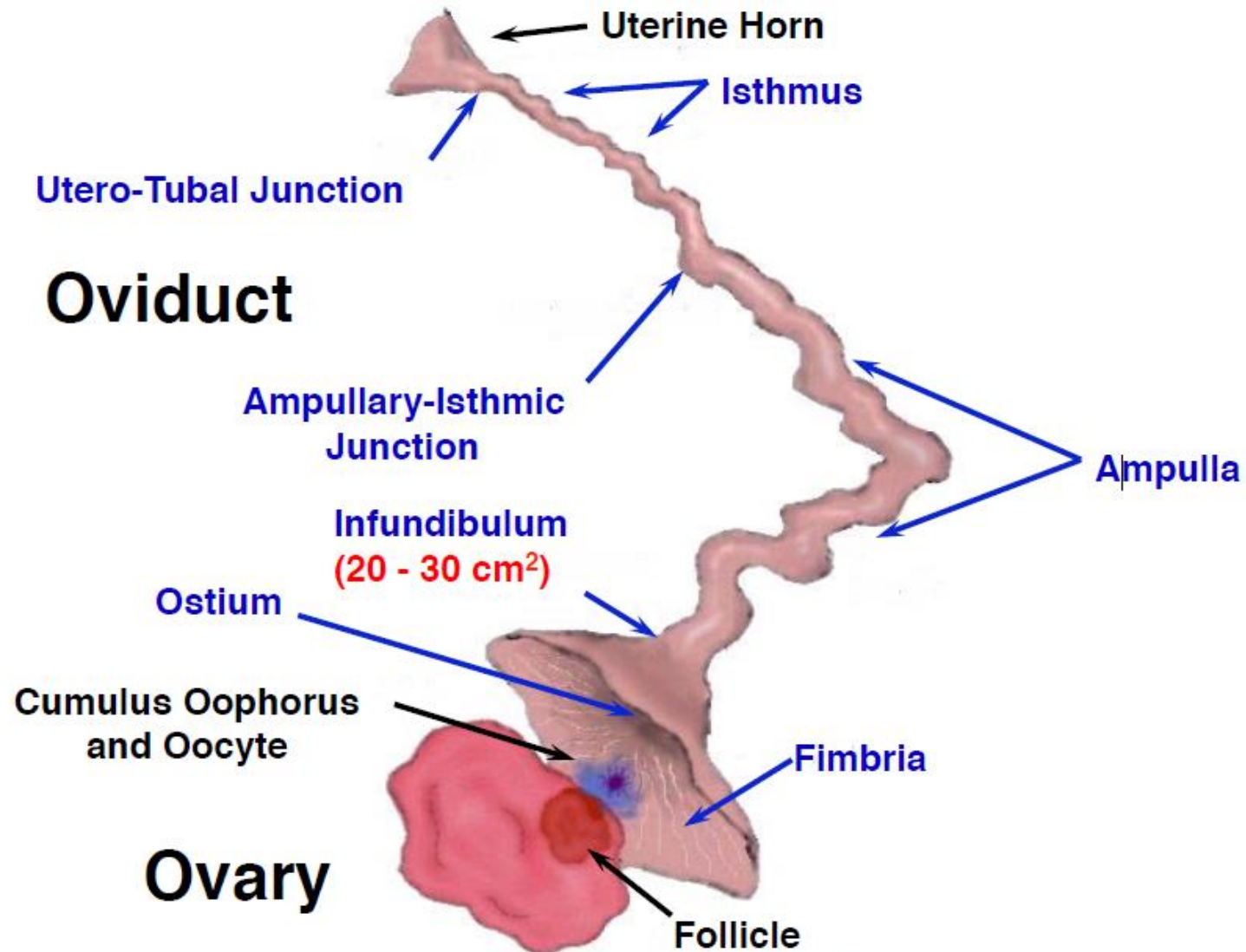


Oviduct

2. Ampulla

- A dilated and the longest segment in the oviduct
- Sperm maturation , fertilization and early embryonic development take place here

Oviduct and Ovaries of Cow

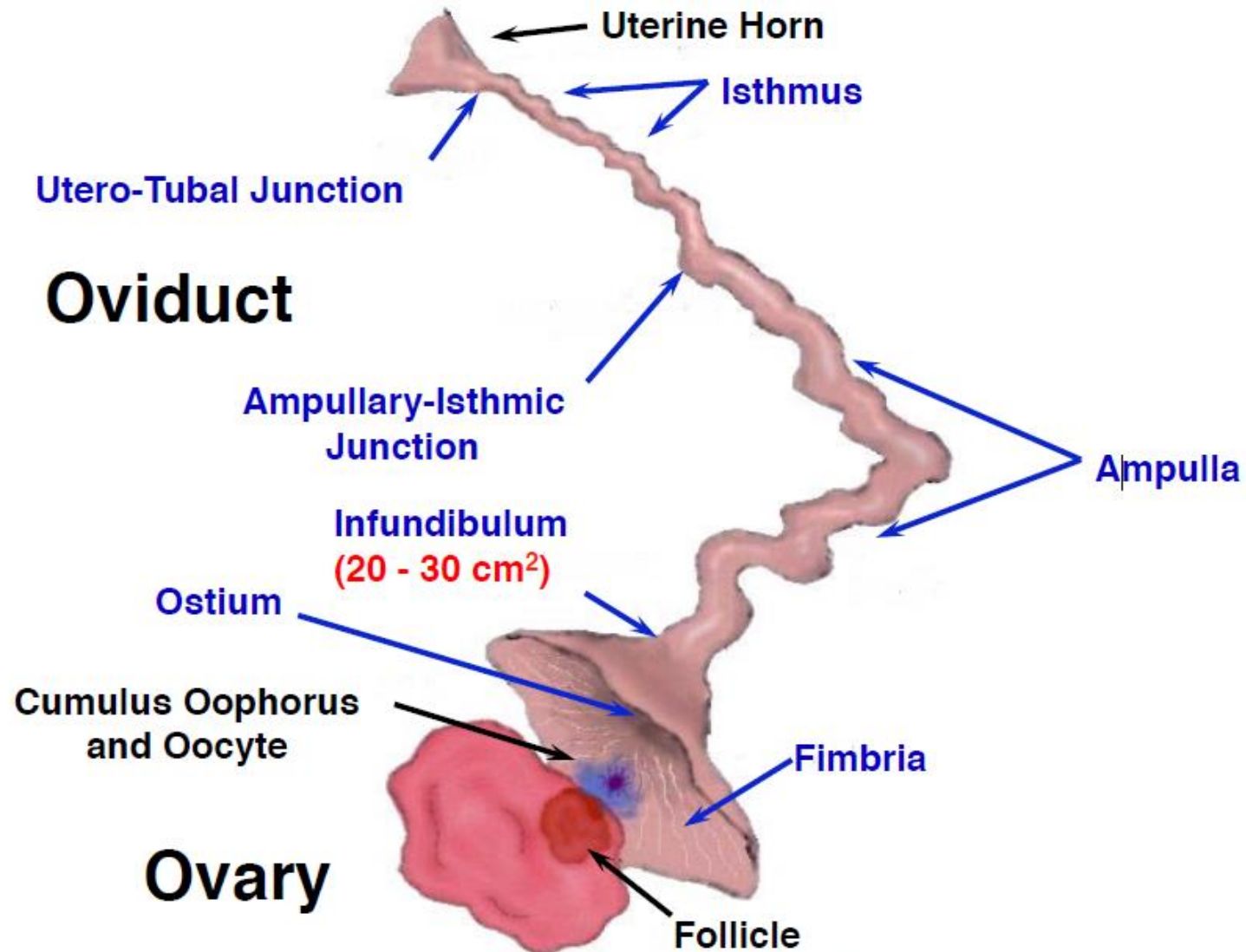


Oviduct

3. Fimbriae

- Funnel like opening to the abdomen
- Locate in close proximity to the ovaries
- Can mobilize in one end via contractions to pick up the eggs from the ovaries when ovulation occurs

Oviduct and Ovaries of Cow

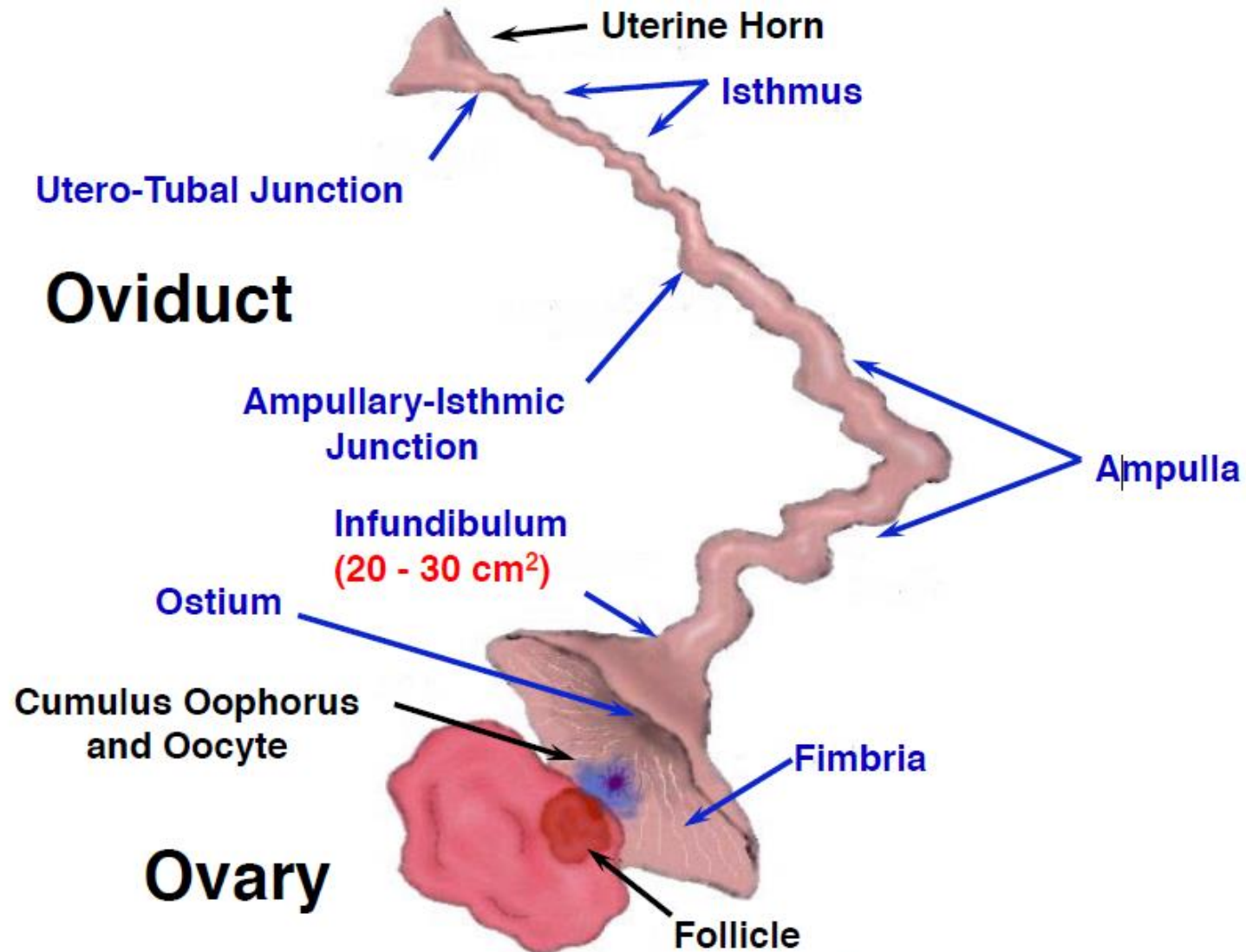


Oviduct

3. Isthmus

- Narrow proximal portion of the oviduct
- Connects with the uterus via utero-tubal junction
- Sperm attach to the mucosa of the isthmus forming “sperm reservoirs” till fertilization

Oviduct and Ovaries of Cow



6. Ovaries

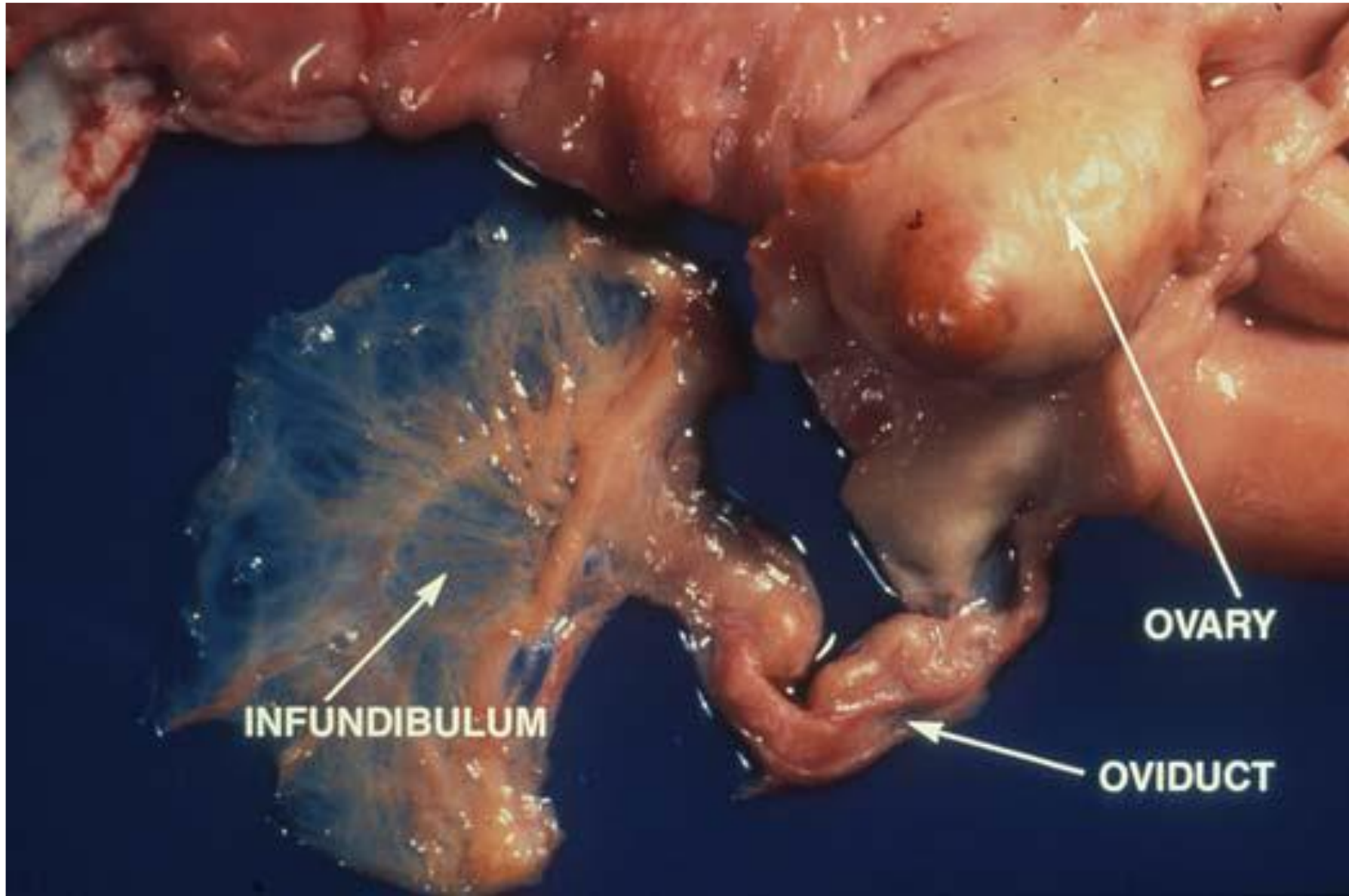
- The ovary, remains in a abdominal position throughout life
- The ovary has a gametogenic (produces ova) and an endocrine function (produces a number of hormones)
- The ovary is an almond shape structure

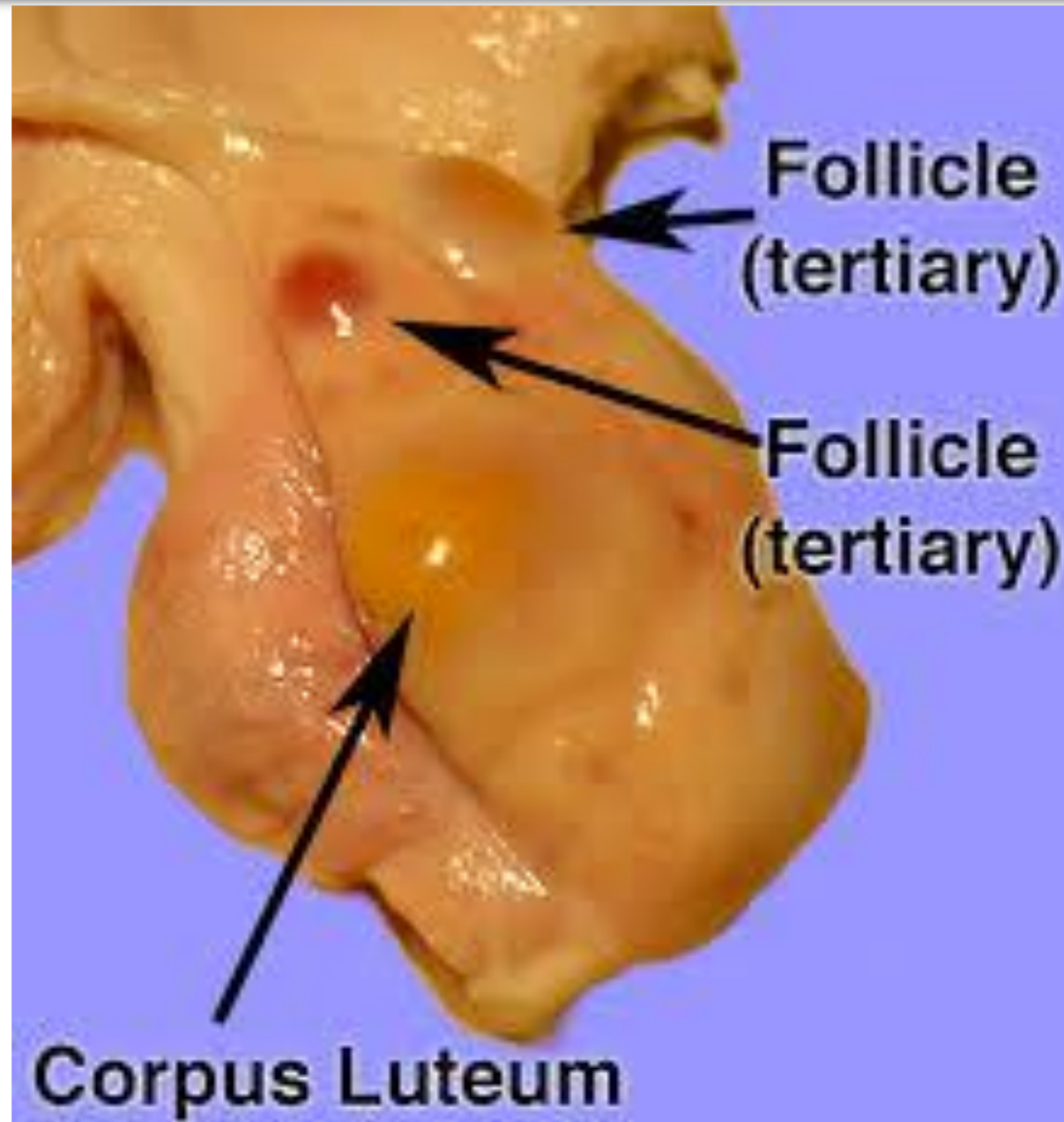
Ovaries

- located at end of fallopian tubes
- possesses large number of eggs in all stages of development
- this is all the eggs she will ever have, unlike the male very few eggs reach maturity
- if not fertilized, the egg is reabsorbed by the body

Hormones Produced by Ovaries

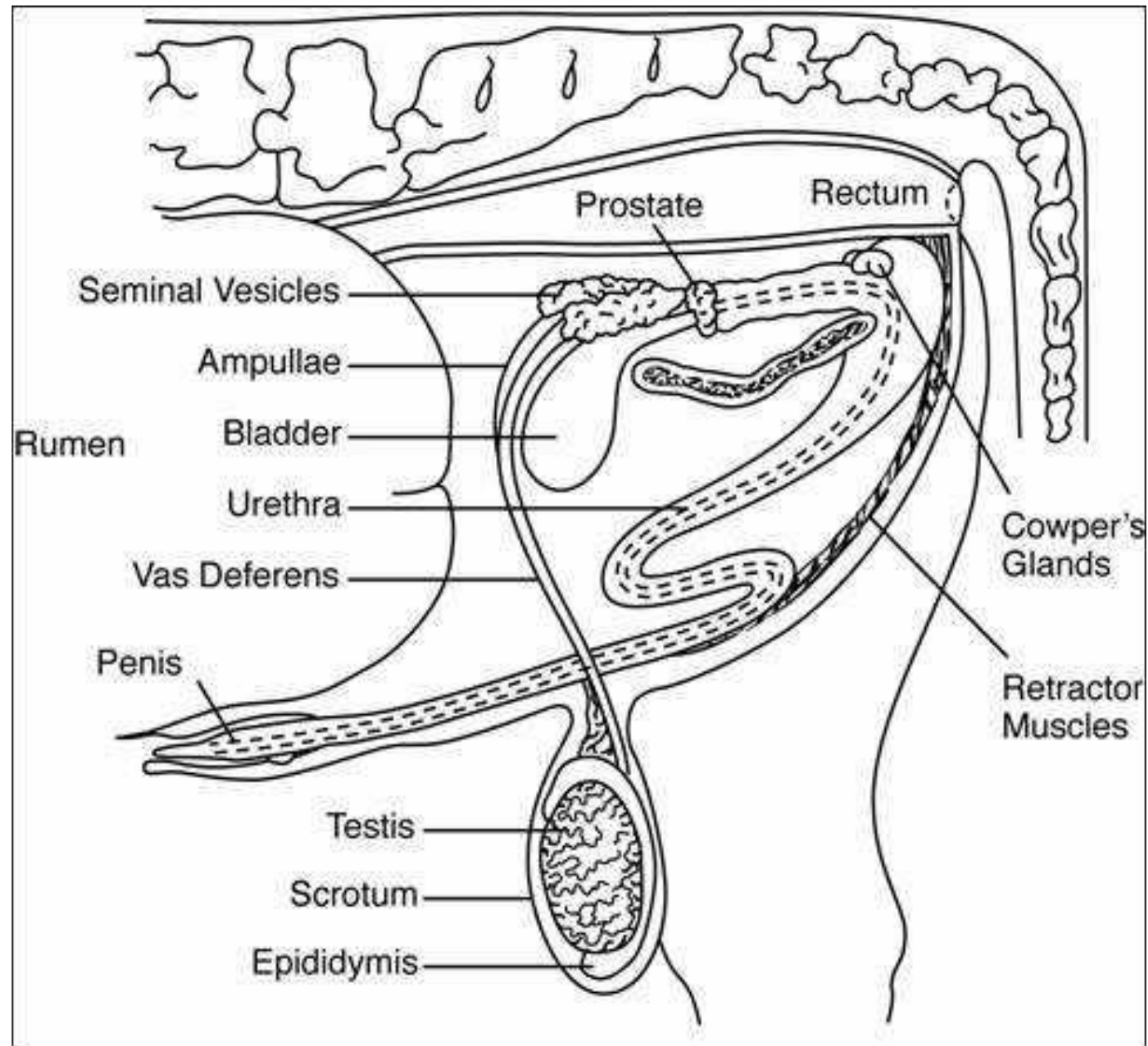
- Estrogen
 - Increase of estrogen causes the nervous system to produce behavioral estrus
- Progesterone
 - When ovulation is completed, the corpus luteum is formed and begins to secrete progesterone to take the animal out of heat



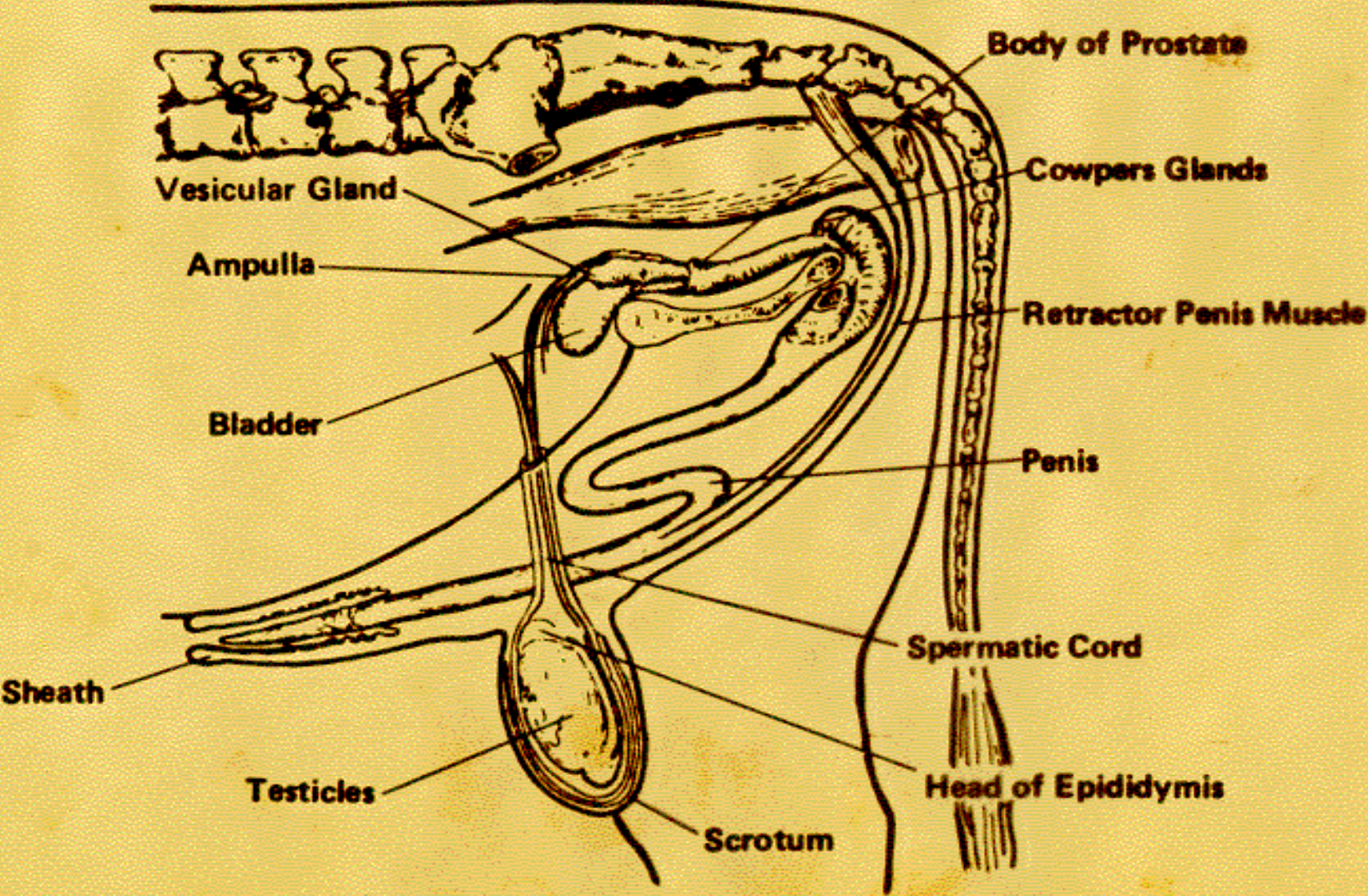


Basic Components of male Reproductive system

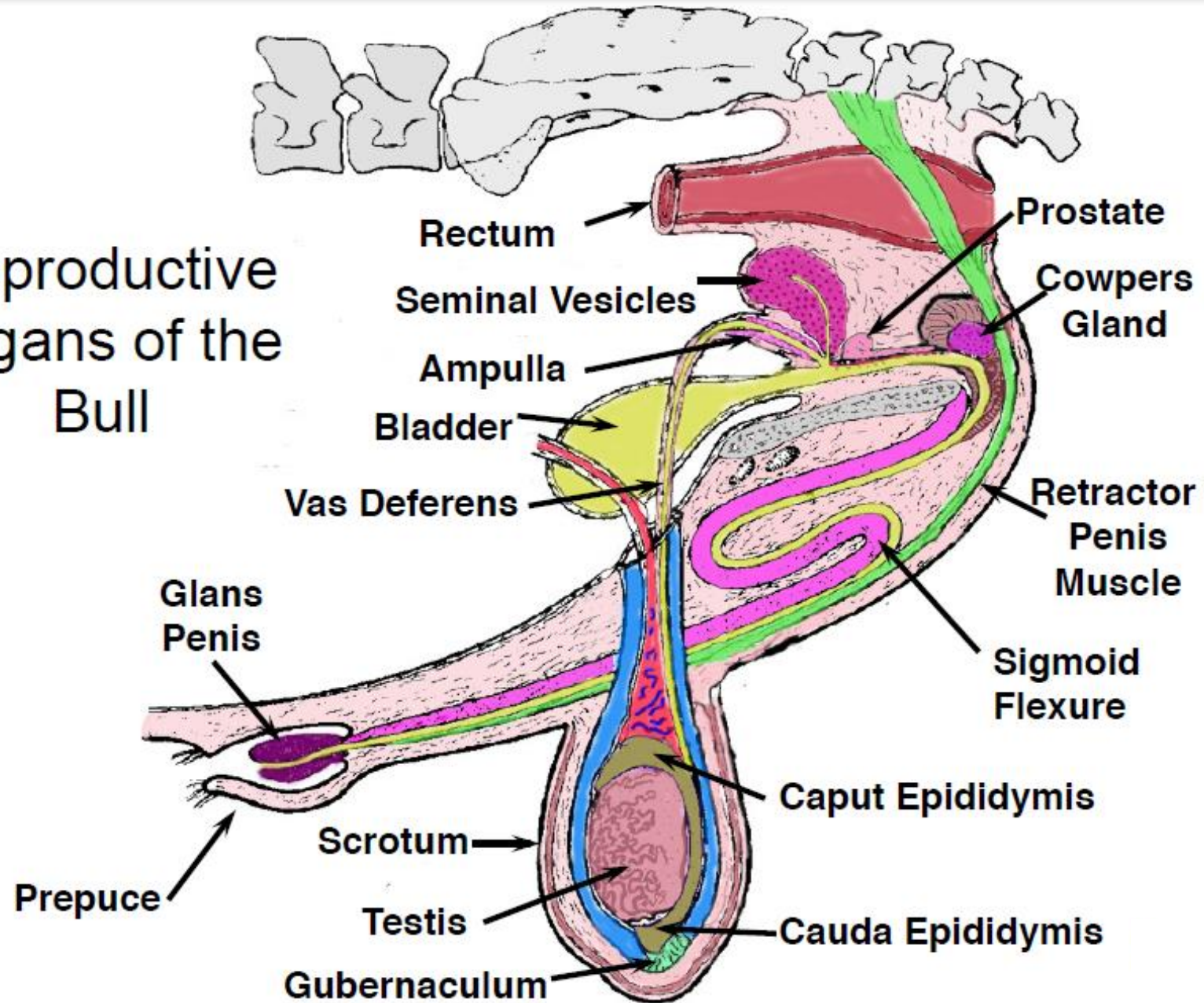
- Spermatic cord
- Scrotum
- Testis
- Excurrent duct system
- Accessory sex glands
- Penis and muscles for protrusion, erection and ejaculation

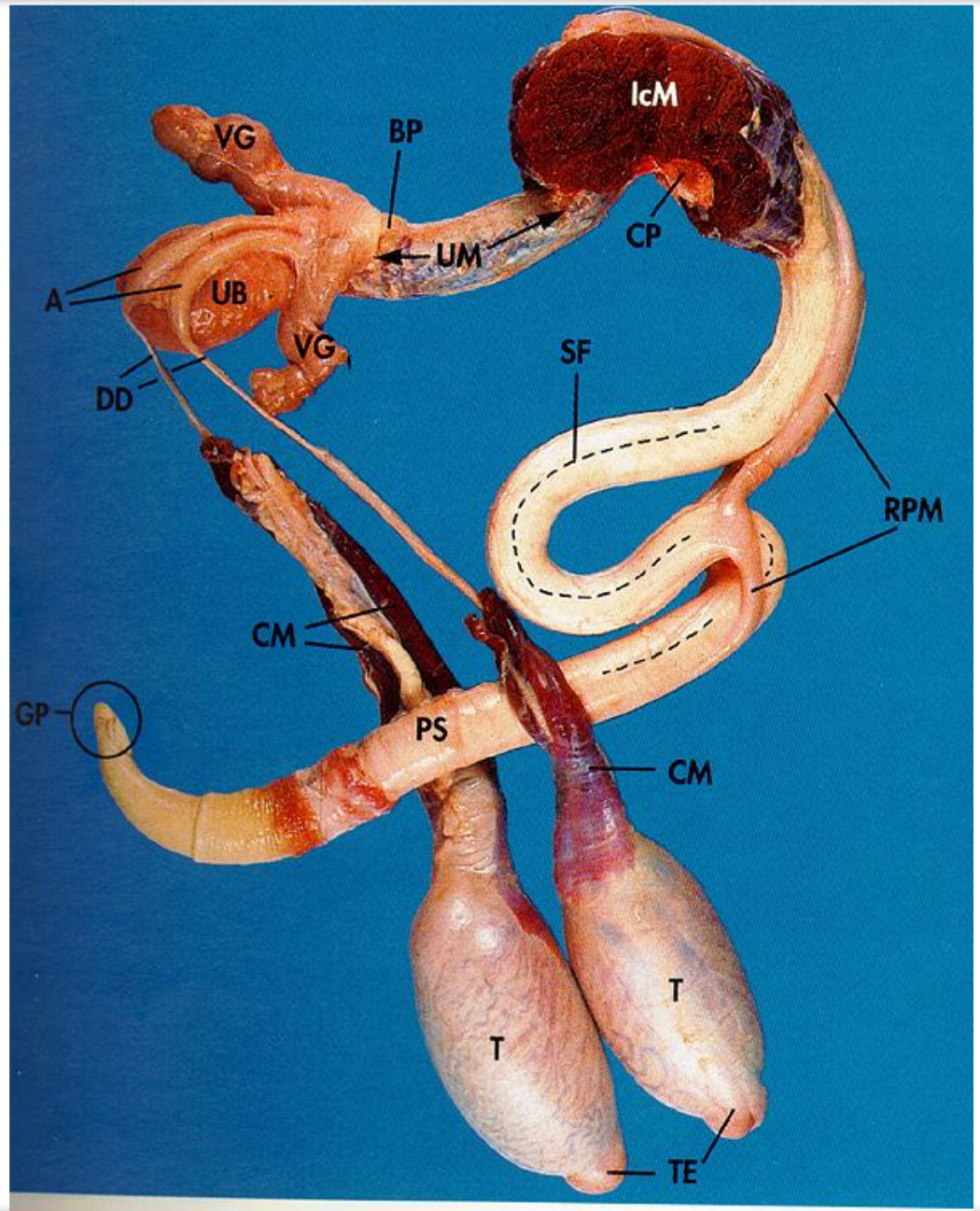


Reproductive Tract of a Bull



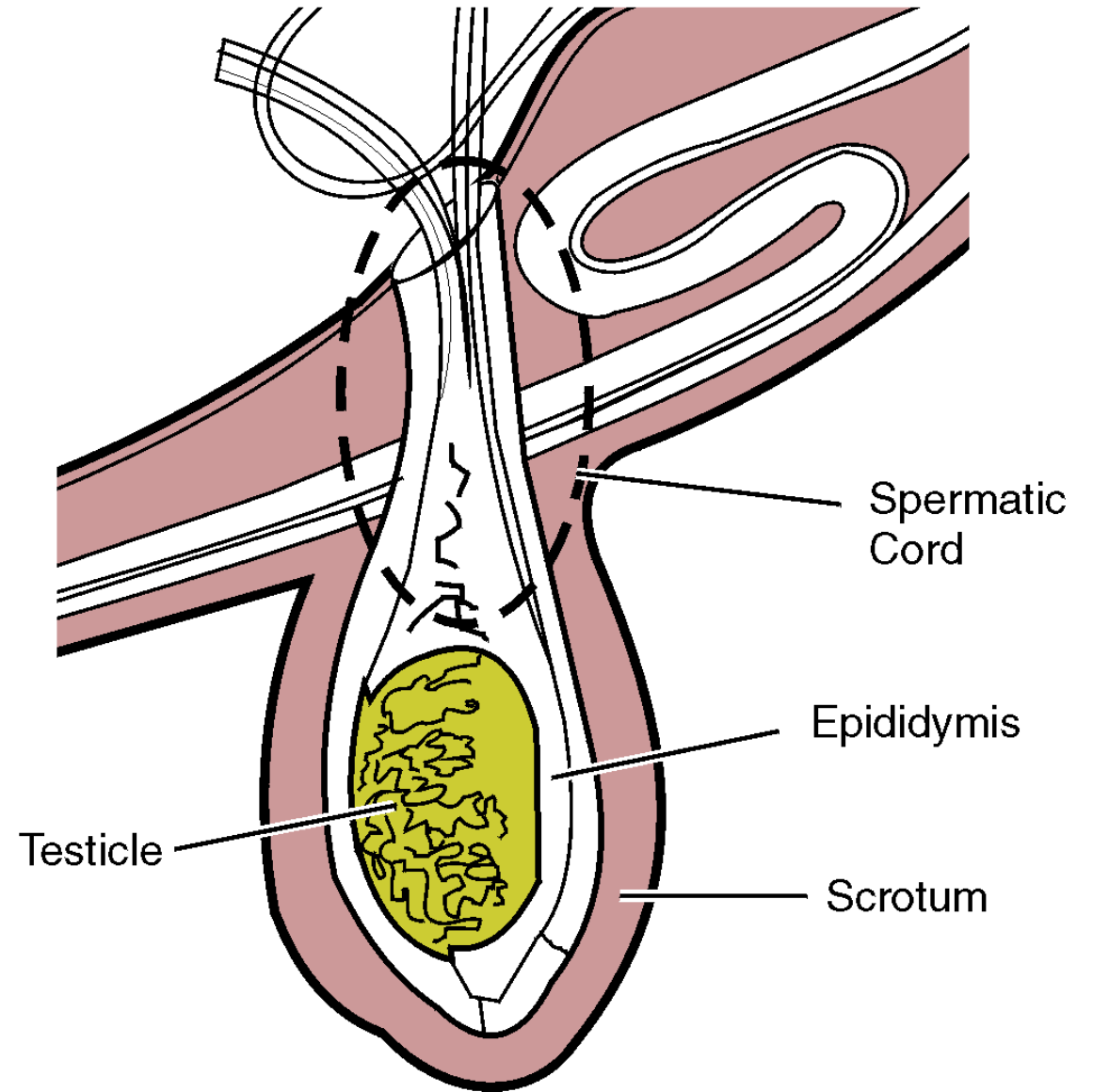
Reproductive Organs of the Bull





Spermatic cords

- Connects testis to body
- Houses
 - Cremaster muscle
 - Pampiniform plexus



Spermatic Cord

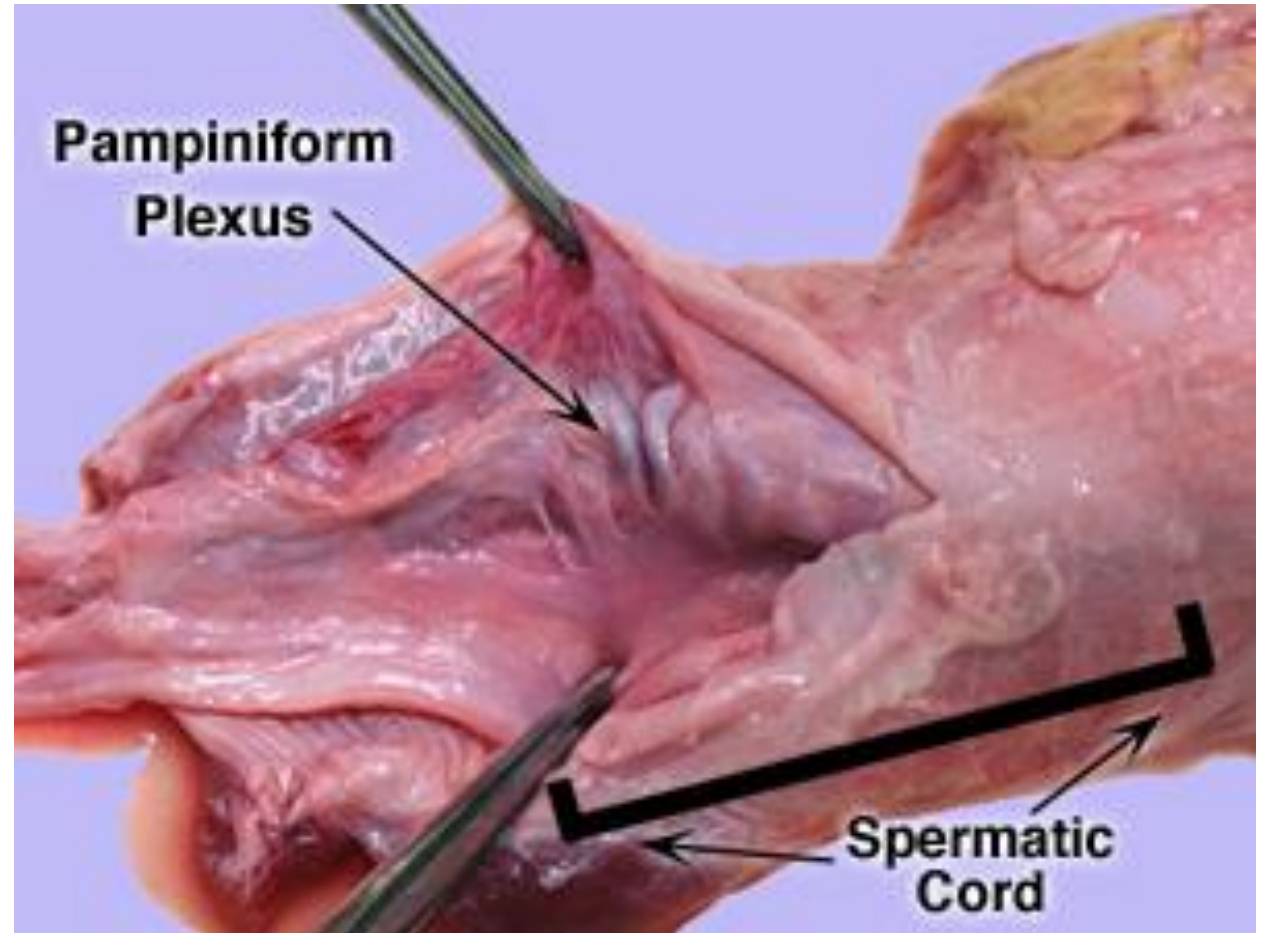
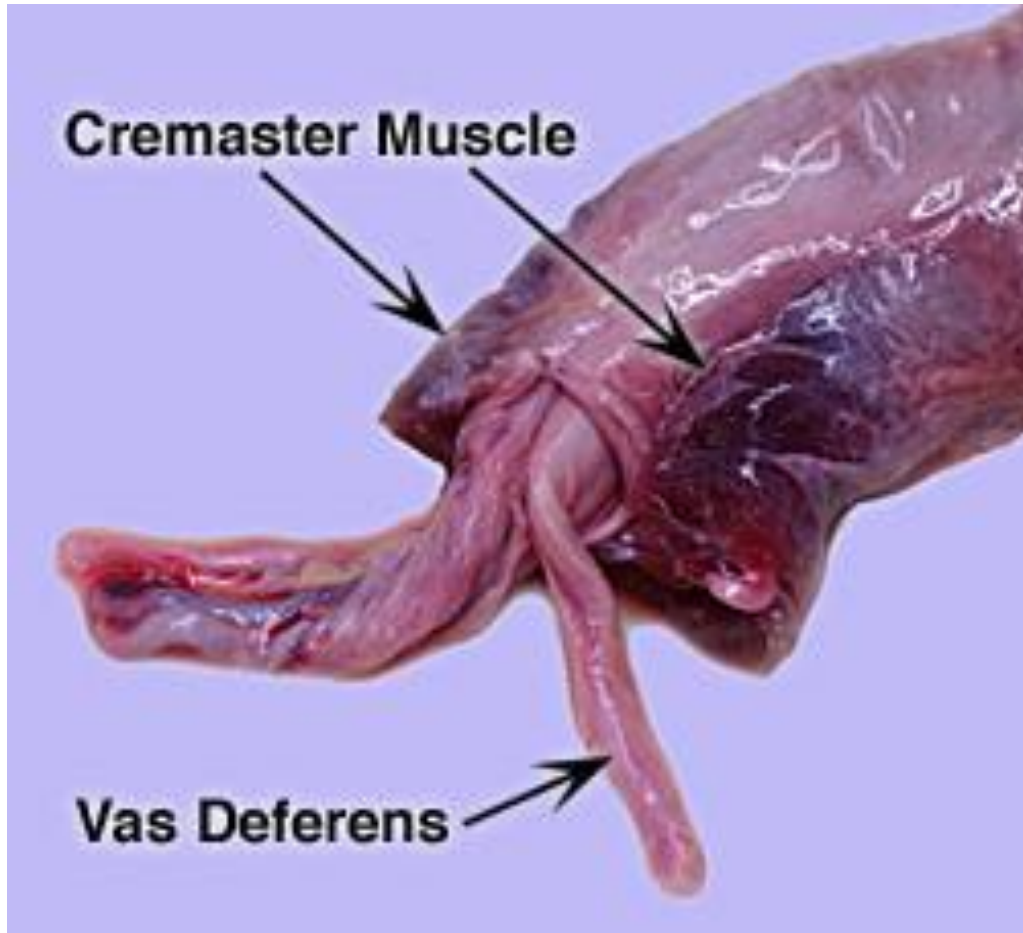
Cremaster Muscle

- 1° muscle supporting testis
- Pumping Action – Facilitates blood flow and cooling efficiency
- Does not elevate testis during cold temperatures

Pampiniform plexus

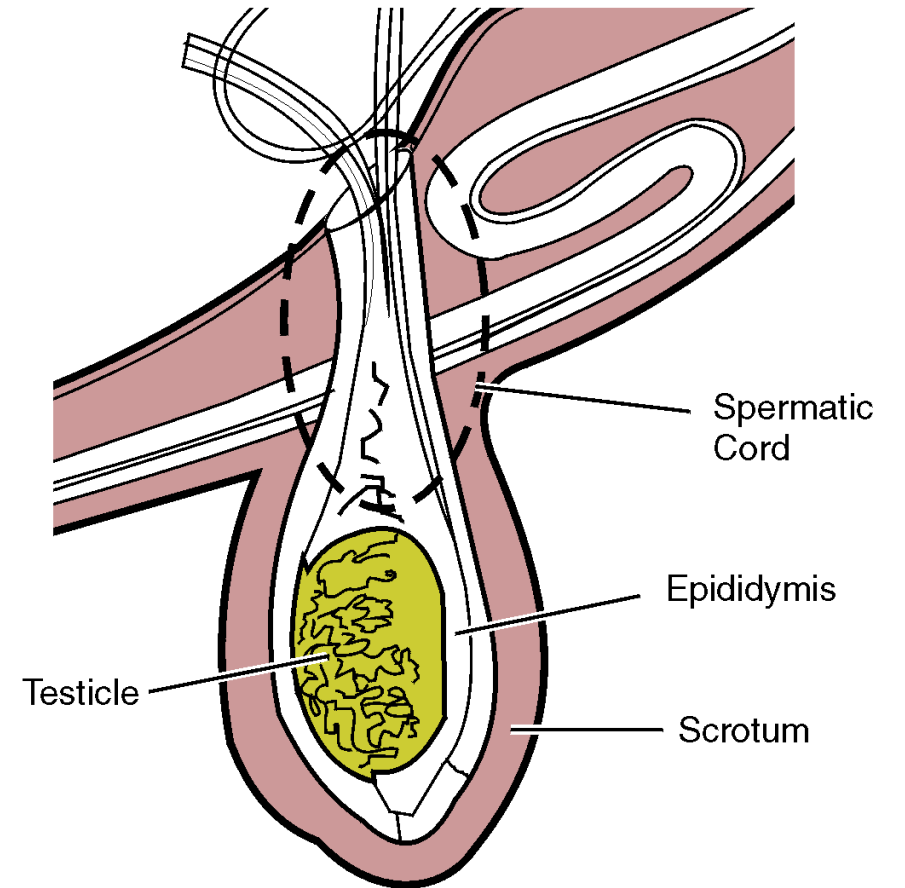
- Cools the blood entering the testis
- -4-6°C Cooler
- Heat transferred from arterial blood to venous blood

Spermatic Cord



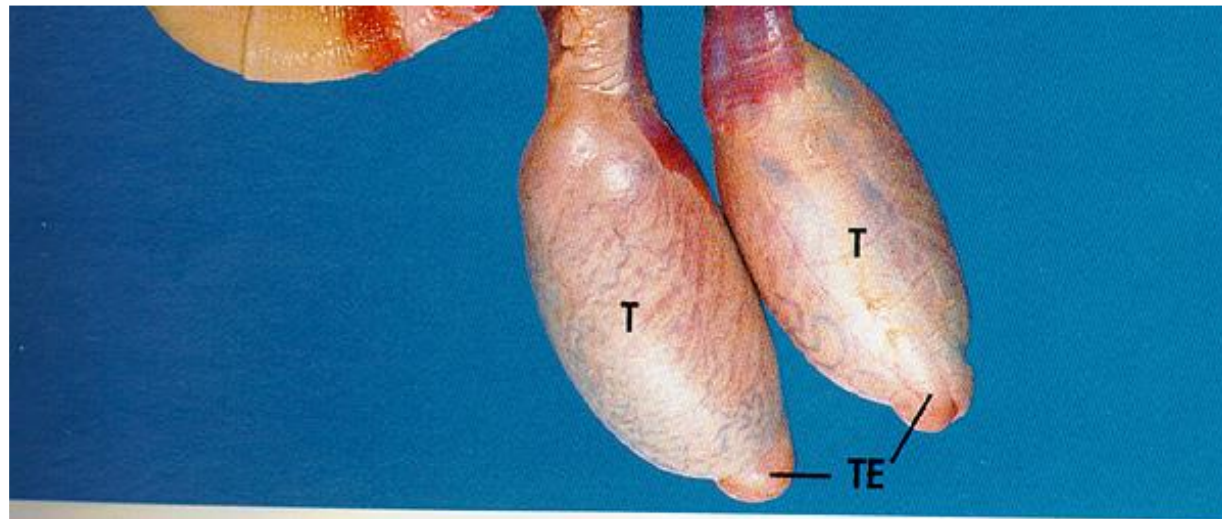
Scrotum

- Thermosensor
- Swap cooler
 - Heavily populated with sweat glands
 - Evaporative heat transfer
- Protective Sac
 - Raises and lowers testis



Testes and Related Structures:

- Testes – paired, ovoid shaped organs that produce sperm cells and testosterone
- Testosterone – the male sex hormone that is responsible for the development of secondary male characteristics and sex behavior (libido)



Epididymis and Related Structures:

- Epididymis – a coiled tube connected to each testis that is responsible for the maturation, storage, and transport of sperm cells

- Epididymis consists of three main anatomical parts :

- Caput epididymis (head) – Sperm Maturation

- Corpus epididymis (body) – Sperm Maturation

- Cauda epididymis (tail) – Sperm Storage

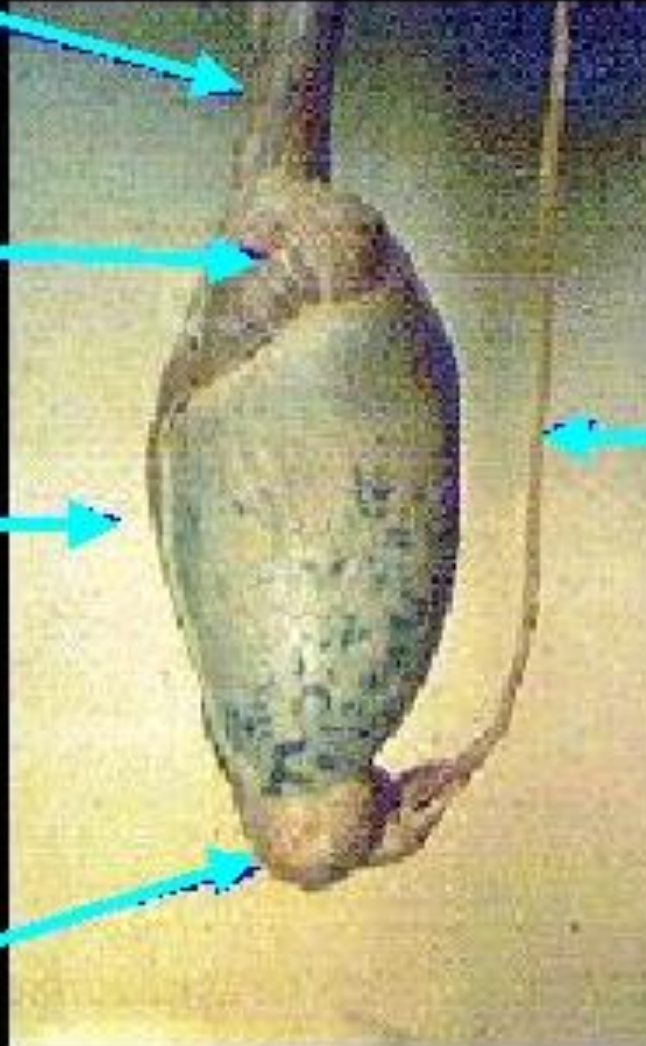
} Transport

Spermatic Cord

(Head) **Caput Epididymis**

(Body) **Corpus Epididymis**

(Tail) **Cauda Epididymis**



Vas Deferens

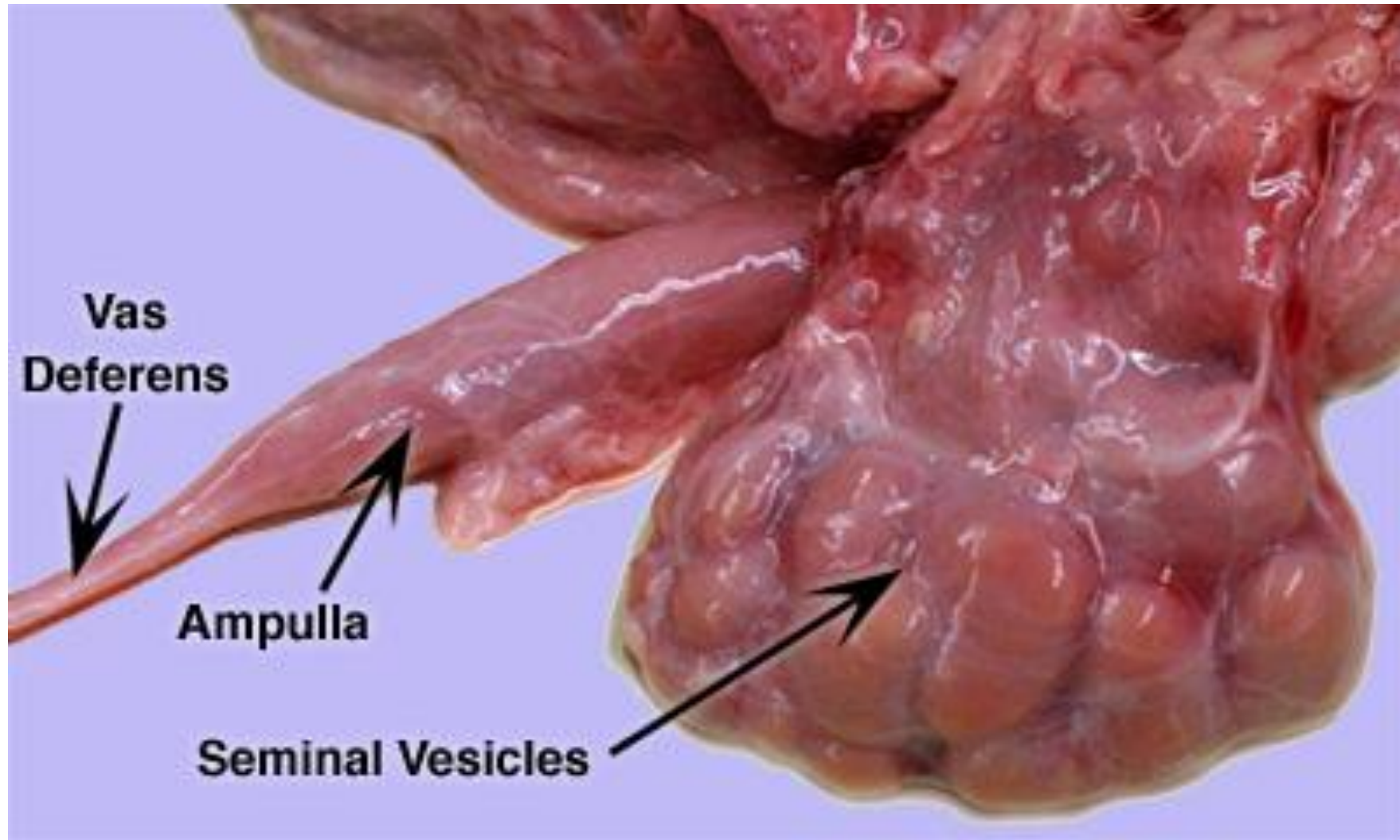
Four major functions occur in the epididymis

01. Transport of the developing sperm cells from the testicle to the *vas deferens*
02. Concentration of the sperm by absorption of surplus fluids
03. Maturation of the developing spermatozoa
04. Storage of viable sperm cells in the epididymis tail

Vas deferens

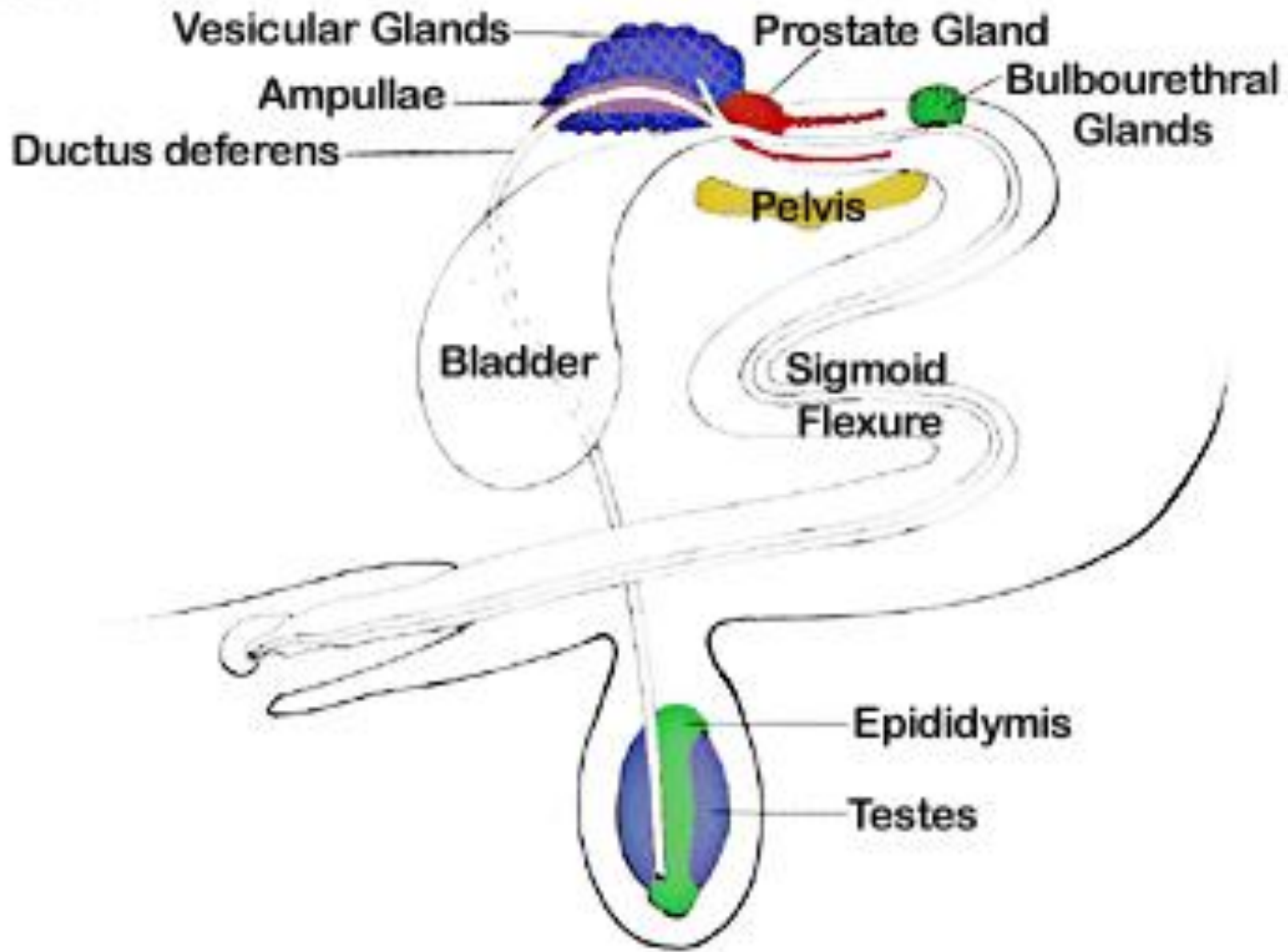
- Vas deferens = ductus deferens
- Deferent Duct (Vas Deferens) – part of the spermatic cord that is the passageway for sperm from the epididymis to the urethra
- The two vas deferences unite to form the urethra ; common passageway for semen from the reproductive tract and urine from the urinary tract
- Before the ejaculatory duct enter to the urethra, the ductus deferens has enlarged and formed Ampullary glands

- Ampullae – an enlargement of the deferent duct that opens into the urethra and may serve as a temporary storage depot for sperm
 - Enlarged ductus deferens before opening to urethra
 - Temporary storage of the sperm before ejaculation
- Urethra – a passageway for both semen and urine that extends from the ampullae and bladder to the end of the penis



Accessory Glands

- The accessory glands are responsible for the production of secretions that contribute to the liquid non-cellular portion of semen known as seminal plasma



Accessory Glands

- Vesicular glands (seminal vesicles) – paired accessory glands that secrete seminal fluid that nourishes the sperm and provides protection and transportation medium for sperm upon ejaculation
- Prostate gland – secretes thick, milky fluid that mixes with seminal fluid to provide nutrition and substance to the semen

Accessory Glands

- Bulbourethral glands (Cowper's glands) – secretes fluid that cleanses and neutralizes the urine residue that can kill sperm cells in the urethra

Penis and Related Structures:

- Penis – the organ that allows for the deposition of semen into the female reproductive tract
- The penises of the bull is fibroelastic, which means that it is primarily composed of connective tissue and depend little on blood for erections
- The rear portion of the fibroelastic type penis forms an S-shaped curve or sigmoid flexure when relaxed

Penis

- The Penis can be divided in to
- three main regions;
 - Root penis or Crura
 - Body of the penis
 - Glans Penis – Cover by repuse

Penis

- Retractor penis muscle – muscle that contracts to retract the penis and form the sigmoid flexure and relaxes to extend the penis upon sexual excitement
- Sheath – external portion of the male reproductive tract that serves to protect the penis from injury and infection.

Erection

- Caused by a neural reflex due to a stimuli
- Stiffening and straightening the penis

Emission

- Movement of the spermatic fluid (sperm+ seminal plasma) along the ductus deferens to pelvic urethra
- Mostly due to the contractions of the smooth muscles.

Ejaculation

- Passage of the semen through penile urethra to the outside