

## Anatomy of the Female Genitalia

### Synonymous:

1. Female Reproductive System
2. Female Reproductive Tract
3. Female Genital System
4. Female Genital Tract
5. Female Genitalia.

### Functions:

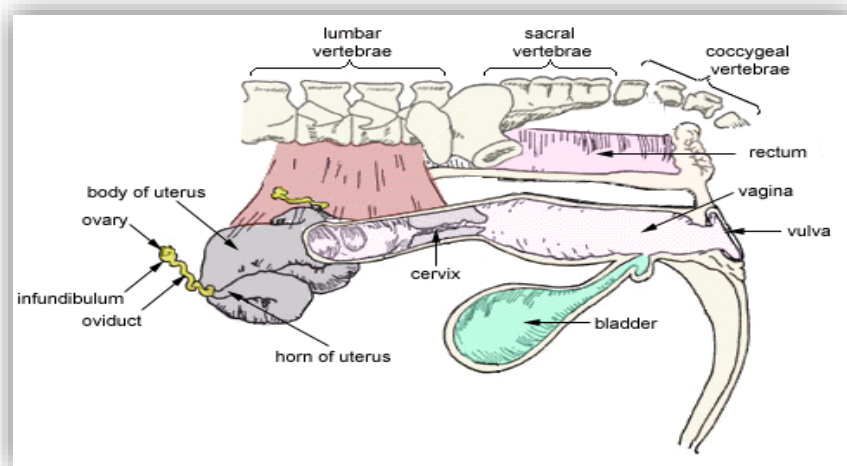
1. Production and development of oocytes
2. Provide an environment for the growth and nourishment of the developing fetus after fertilization.
3. Synthesis of hormones.

### Location:

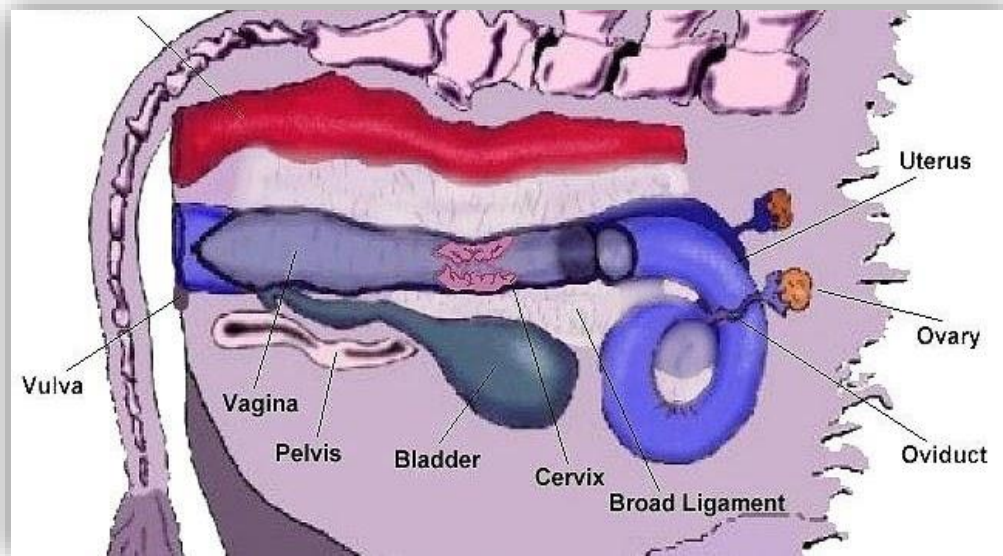
- Locate in the pelvic region between the rectum (distal part of the large intestine) from above and urinary bladder from below.

### Anatomical parts:

- A. **Internal genitalia:** Ovaries, Uterine Tubes (oviducts), Uterus (horns, body, and cervix).
- B. **External genitalia:** Vagina, Vestibule, and Vulva (Labia and Clitoris).



*Figure 1 location of reproductive organs of the cow*



*Figure 2 reproductive organs of the cow*

## The Ovaries

Two paired glands that provide for the development of oocytes and production of hormones, suspended from the dorsal wall to the abdomen by the mesovarium (part of the broad ligament) easily manipulated by rectal palpation. The ovary is almond-shaped in most species but it is a bean (kidney)-shaped in the mare, and berry (cluster of grapes) -shaped in the sow.

In most species; ovulation (release of oocyte) occurs in any site of the ovarian surface (cortex), but it occurs over the entire surface (medulla) in the mare they are confined to one site – ovulation fossa (indentation).

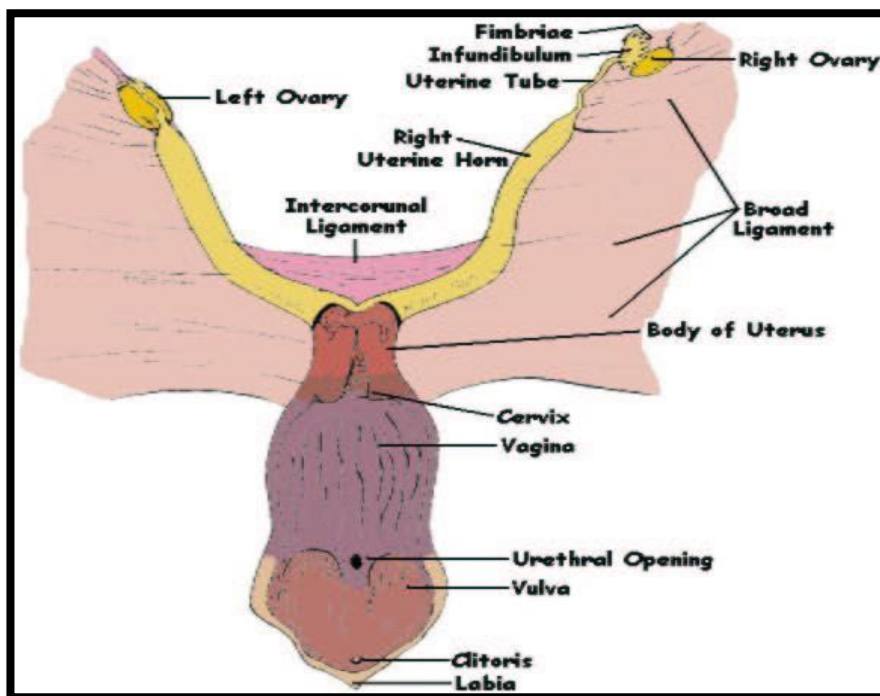


Figure 3 The broad ligament (a downward reflection of the peritoneum) suspends the reproductive tract from the dorsolateral abdominal wall.

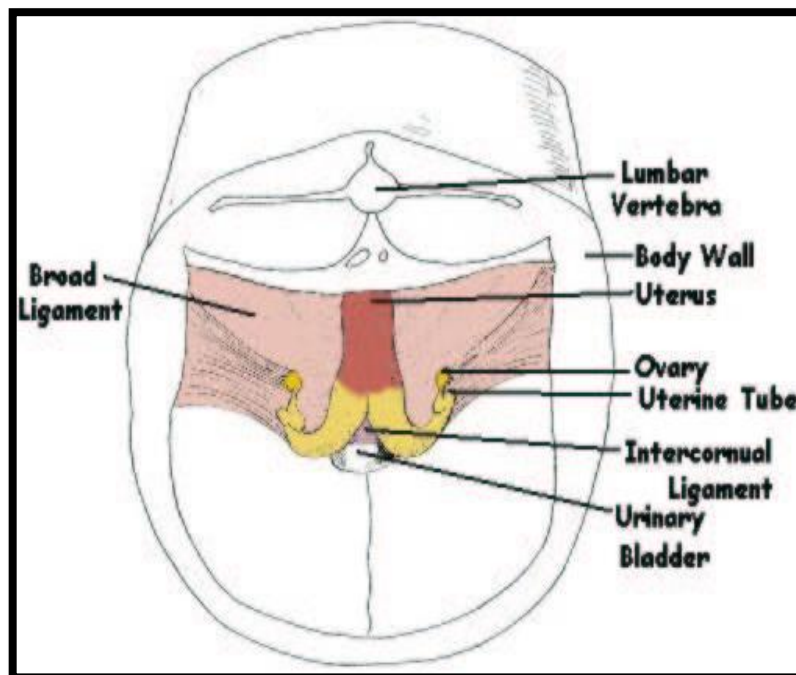


Figure 4 Cranial view of bovine female reproductive organs. The broad ligament is the inclusive term for the mesovarium, mesosalpinx, and mesometrium that suspend the ovary, uterine tubes, and uterus, respectively, from the dorsolateral wall of the sub-lumbar region. The broad ligament is a reflection of the peritoneum.

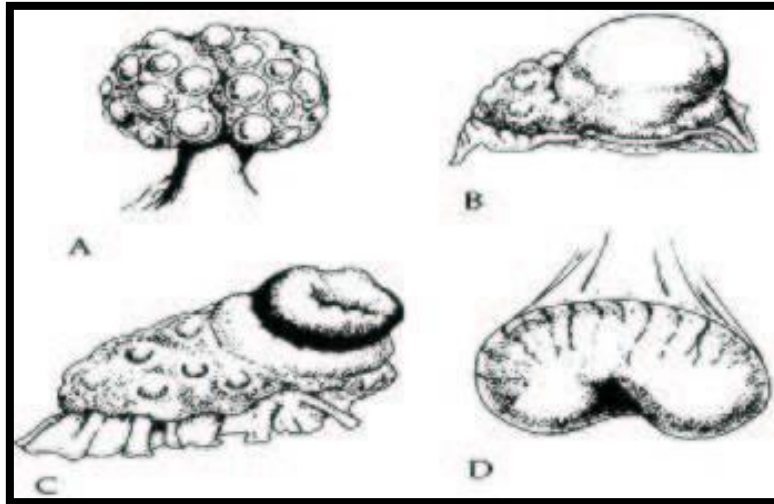


Figure 5 A. sow ovary, B. almond-shaped cow ovary with ripening follicle. C. Cow ovary with fully developed corpus luteum. D. Mare ovary (kidney-shaped) with ovulation fossa (indentation).

### Histological Structure of ovary

The ovary is composed of a network of broad ligaments and blood vessels surrounding the ovarian bursa except the "Hilus" which the blood supply and nerves enter. The ovary is composed of many layers:

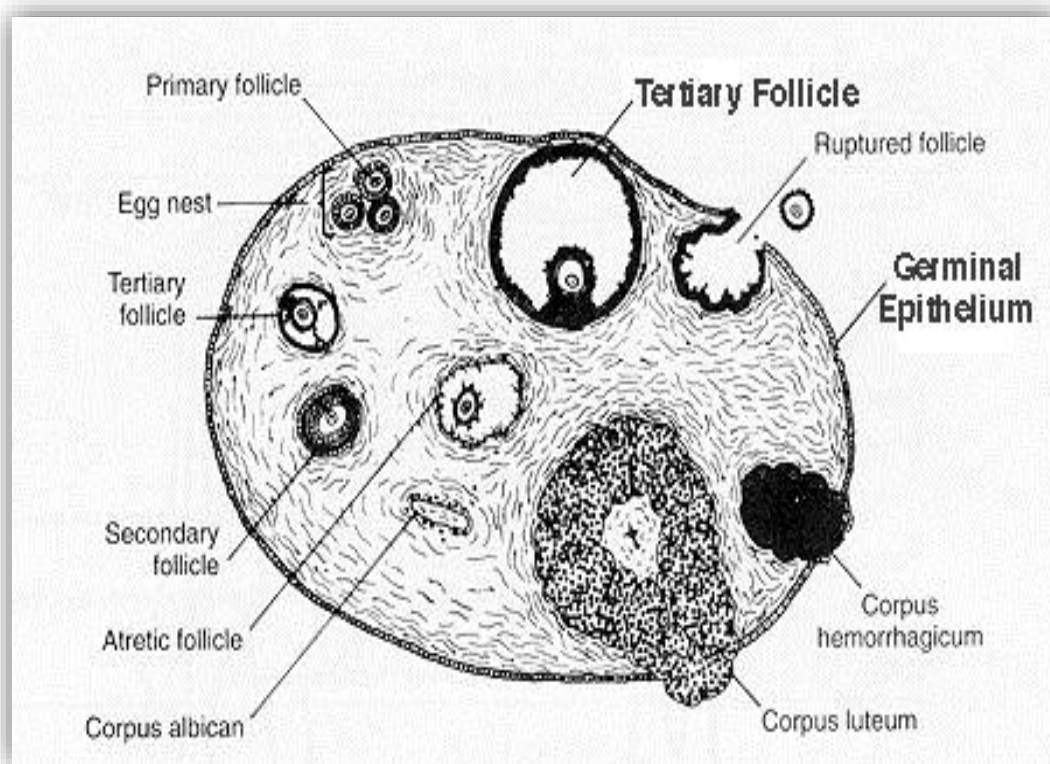
- a. Epithelium – the surface layer
- b. Tunica albuginea – connective tissue covering the entire ovary
- c. Cortex: the outer layer of the ovary has many primordial (primary) follicles, secondary follicles, mature follicles, preovulatory (Graffian) follicles, corpus luteum (yellow body), and corpus Albicans (white body).
- d. Medulla: the medulla has interstitial cells, nerves, blood, and lymphoid vessels.

The ovulation occurs from the cortex in all animals except in the mare which occurs from the medulla from a site called "ovulation fossa" and the process called "internal ovulation".

### 1. Physiologically (Function of ovaries):

The ovary has two functions:

- a) Production of female gametes (ova).
- b) Production of hormones:
  - Estrogen: theca and granulosa cells.
  - Progesterone: granulosa cells and corpus luteum.
  - Inhibin: interstitial cells.
  - Relaxin: Corpus Luteum.



*Figure 6 histology of ovary*

### **Follicles and cells:**

1. Primordial follicles – contain a single oocyte surrounded by a single layer of granulosa cells
2. Granulosa cells are derived from the epithelium
3. Oocytes are derived from mitosis of oogonia in the embryonic genital ridge that then migrates to the ovary
4. Growing follicles: have two or more layers of granulosa cells, zona pellucida may be present surrounds the oocyte.
5. Graafian follicles: two layers of thecal (theca) cells (interna and external).  
The hormone-dependent and begins at puberty under the influence of gonadotropic hormones, luteinizing hormone (LH), and follicle-stimulating hormone (FSH) which are secreted from the anterior pituitary
6. Atretic follicles (regression, turning over without ovulation).
7. Corpus Luteum (CL): form after ovulation of follicle by rapid vascularization of granulosa cells and produces progesterone – the hormone of pregnancy.

### **Uterine (fallopian) Tubes**

Paired, convoluted (coiled) tubes aids to transport the oocytes from ovaries to uterus and serve as a site of fertilization, it long (15-30 cm in length) and consist from:

1. Infundibulum.
2. Ampulla.
3. Isthmus.

#### **Functions:**

1. Reception of ova after ovulation.
2. Transport and capacitation of both ova and sperms.
3. Site of fertilization (ampulla-isthmus junction).
4. Filtration of dead sperms (isthmus).

The fimbriae assist in directing the oocyte into the infundibulum lined with both secretory and ciliated cells for the movement of both oocytes and spermatozoa.



The fallopian tubes have both circular and longitudinal muscles which also aid in the transport of oocytes and spermatozoa. Supported by a continuation of the mesovarium.

### **Uterus:**

It is a muscular womb located in the pelvic region (in non-pregnant females) and in the abdominal region in the pregnant female), the organ starts from the junction with oviducts into the cervix, consists from:

1. Corpus (body).
2. Cervix (neck).
3. Two Cornua (horns).

#### **Tissue layers**

1. **Endometrium:** highly glandular over the entire lining except for ruminants which have mushroom-shaped projections called caruncles where fetal membranes attach, the fetal sides are called cotyledons.

This layer varies in thickness and vascularity under the influence of both hormonal changes and pregnancy. Glandular secretions provide nutrients to the embryo before implantation and development of the placenta (uterine milk).

2. **Myometrium:** muscular portion of the uterus and the primary function is in aiding the expulsion of the fetus

3. **Serous covering for support (mesoderm):** provides suspensory support for the uterus. They are two broad ligaments on each side that support the uterus and various structures on their respective sides.

### **Functions of the uterus:**

1. Capacitation and transport the sperms.
2. Incubation of blastocyst before placentation.
3. Implantation of zygote.
4. Nourishment and prevention of the embryo during pregnancy period.
5. Produce some hormones aid in parturition and giving birth.

## Cervix

Heavy, smooth muscle sphincter (5-7 cm in length and 3-5 cm in diameter). The structure has 3-5 rings called “annular rings” and has two orifices (internal and external). The cervix was tightly closed except during estrus and parturition secretes outward flowing mucus from goblet cells. The mucus flow prevents infective materials from entering the uterus from the vagina.

### Functions:

1. Protection of the uterus from any foreign.
2. Good site for deposition of the semen in artificial insemination (cow, ewe) or normal copulation (mare, sow).
3. Good storage for spermatozoa.
4. Filter for dead spermatozoa.
5. Secretion a mucous during estrus and pregnancy.
6. Strong sphincter to close the uterus and prevention of the fetus during pregnancy period.

## Vagina

Within the pelvis, between the uterus and vulva, sheath for the male penis during copulation urethral open of discharge of urine, the passage of fetus during parturition

### Vulva (vestibule of the vagina)

The caudal portion of the female genitalia is located from the urethral opening to the exterior of the genitalia. Clitoris (female vestigial counterpart to the male penis) erectile tissue and sensory nerve endings.

#### Bartholin glands:

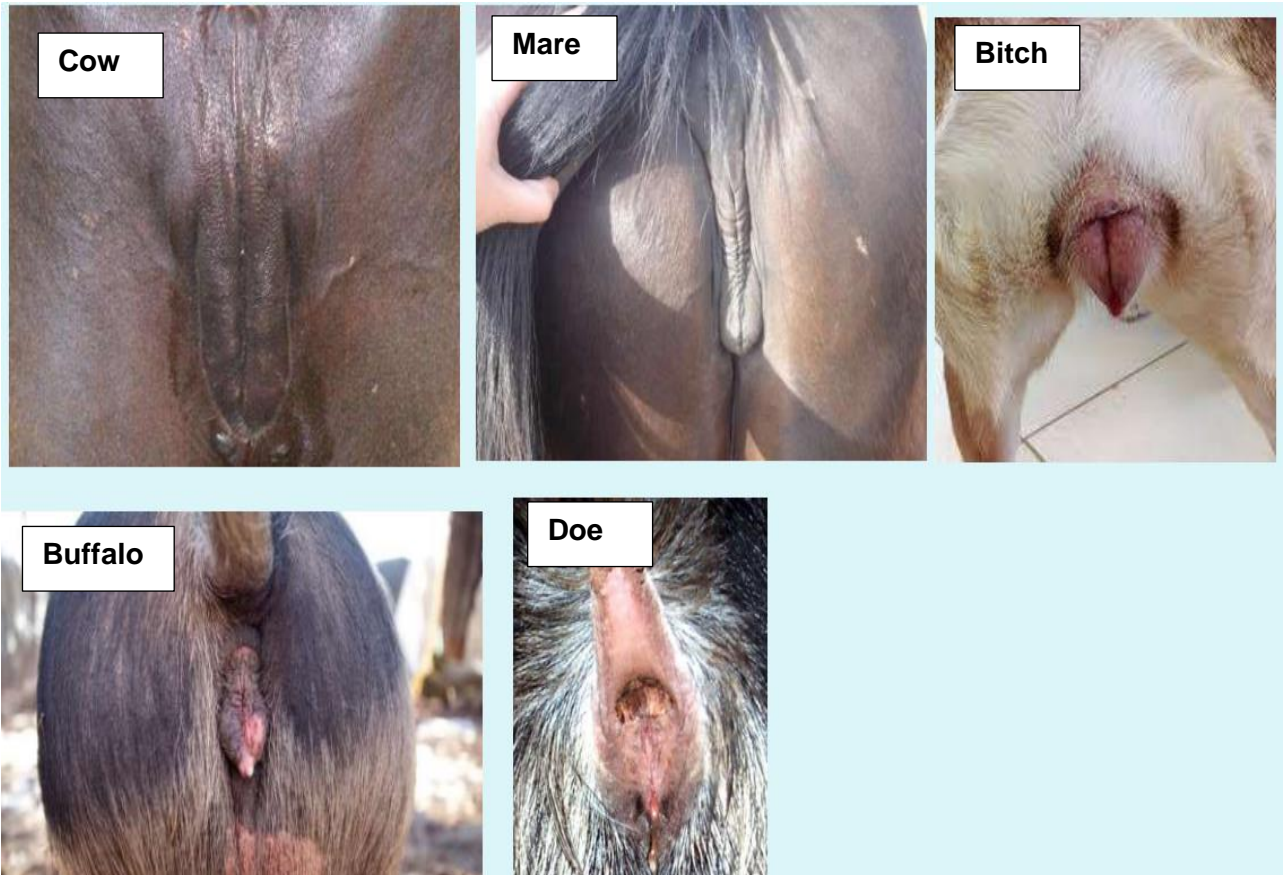
Two glands located on either side of the vestibule, secreted a mucous secretion during the copulation aid to make a lubricant for the male penis.

## Labia

External portion composed from the outer skin, hairless, and it's an elastic structure that forms a closure to minimize the entrance of foreign material into the reproductive tract and has two commissures (dorsal and ventral. There are two types of labia:



- Labia minora: which is found in (women, advanced mammals) and absent in most farm animals.
- Labia majora: which is found in all females.



*Figure 7 shape of labia in animals*

### **Clitoris:**

Genitalia erectile has the same generated penis in the male, composed from erectile tissue and equipped with nerve endings, it is very sensitive especially in the estrus phase. The clitoris is very developed in a mare and erects during intercourse (winking).

### **Hymen:**

A thin membrane separates the vestibule from the vagina, and it is located in some of the females (women) and missing or vestigial in others (cattle). Hymen has a hole that allows the passage of uterine secretions and blood during the reproductive cycle (menses).

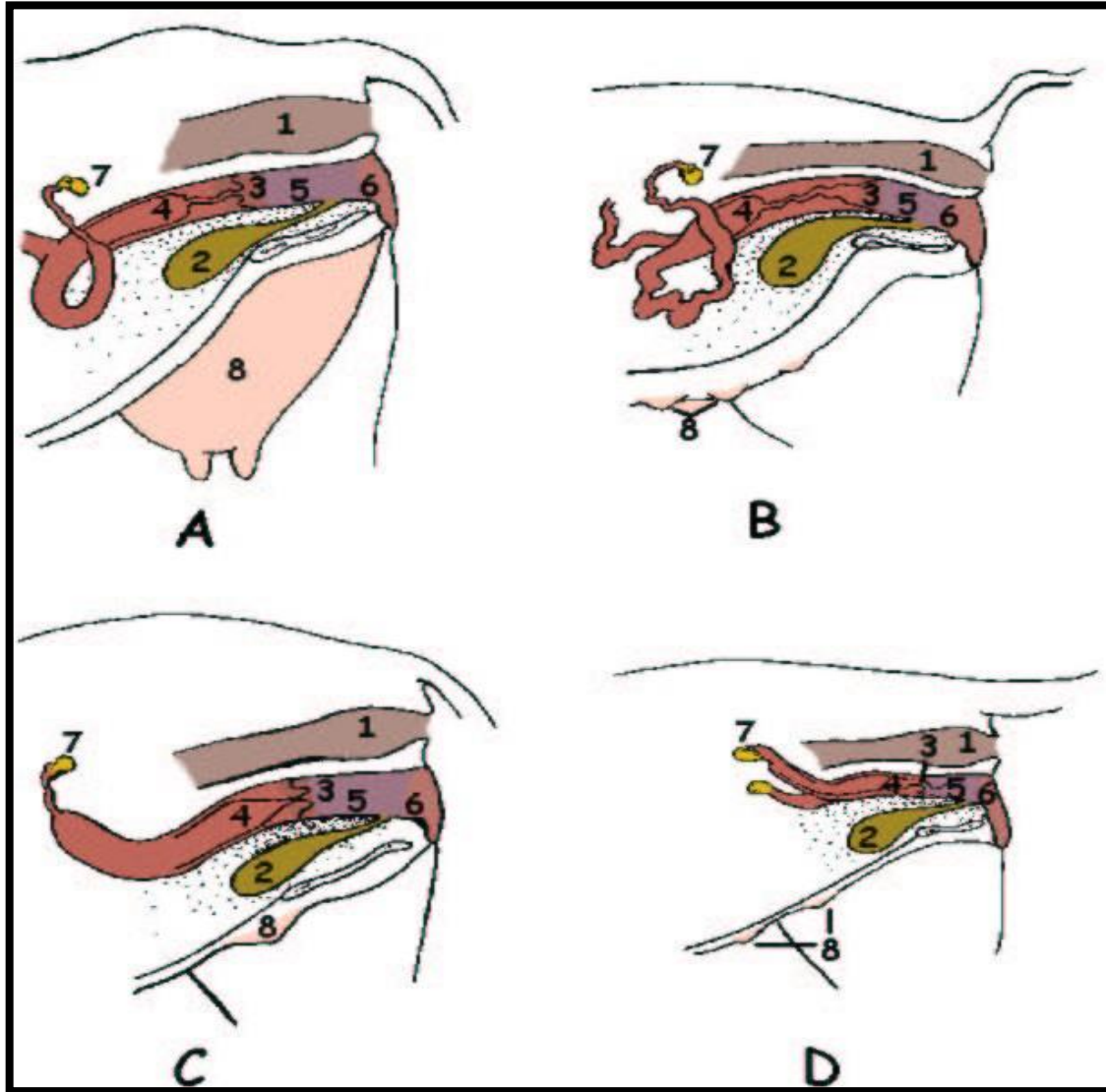
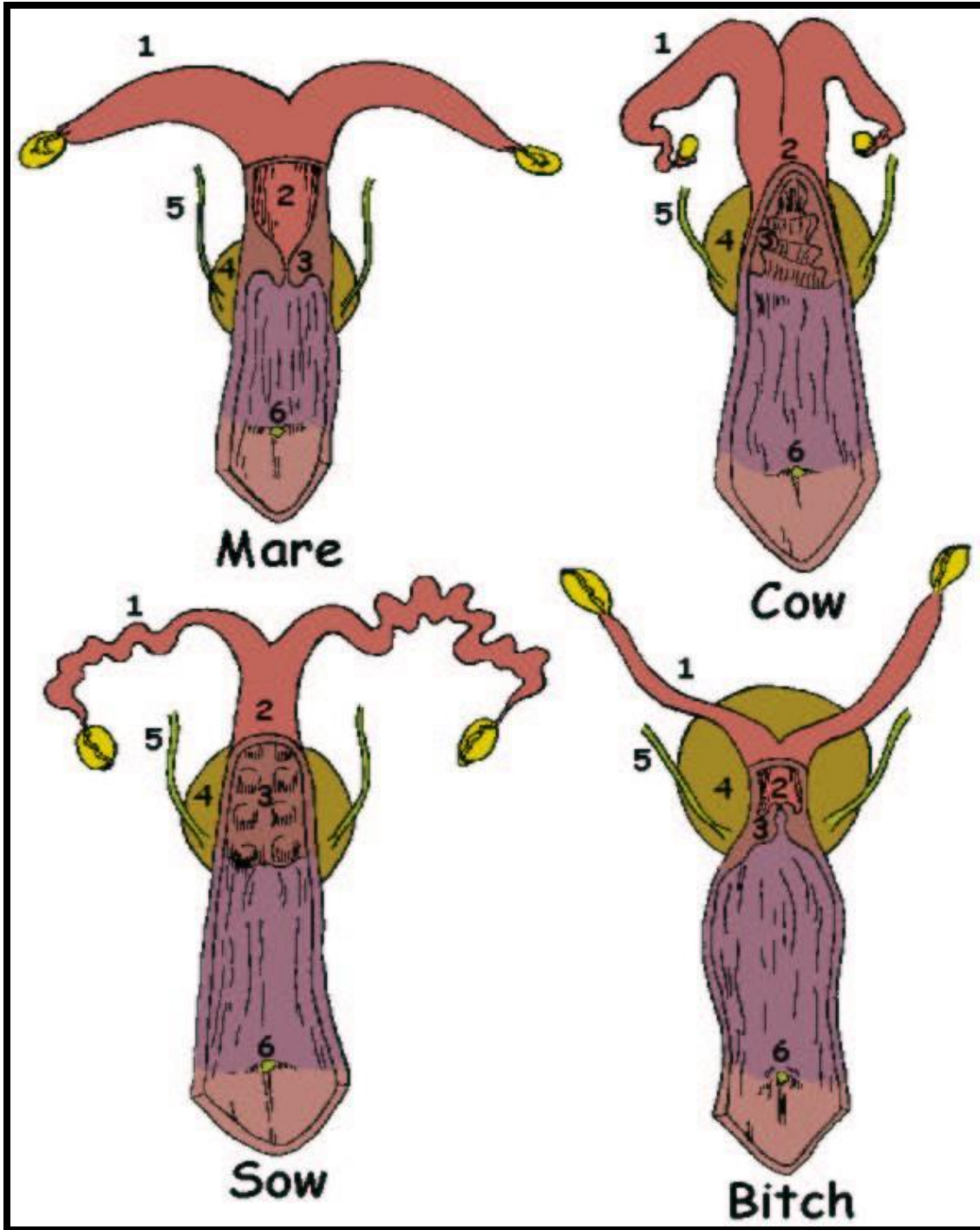


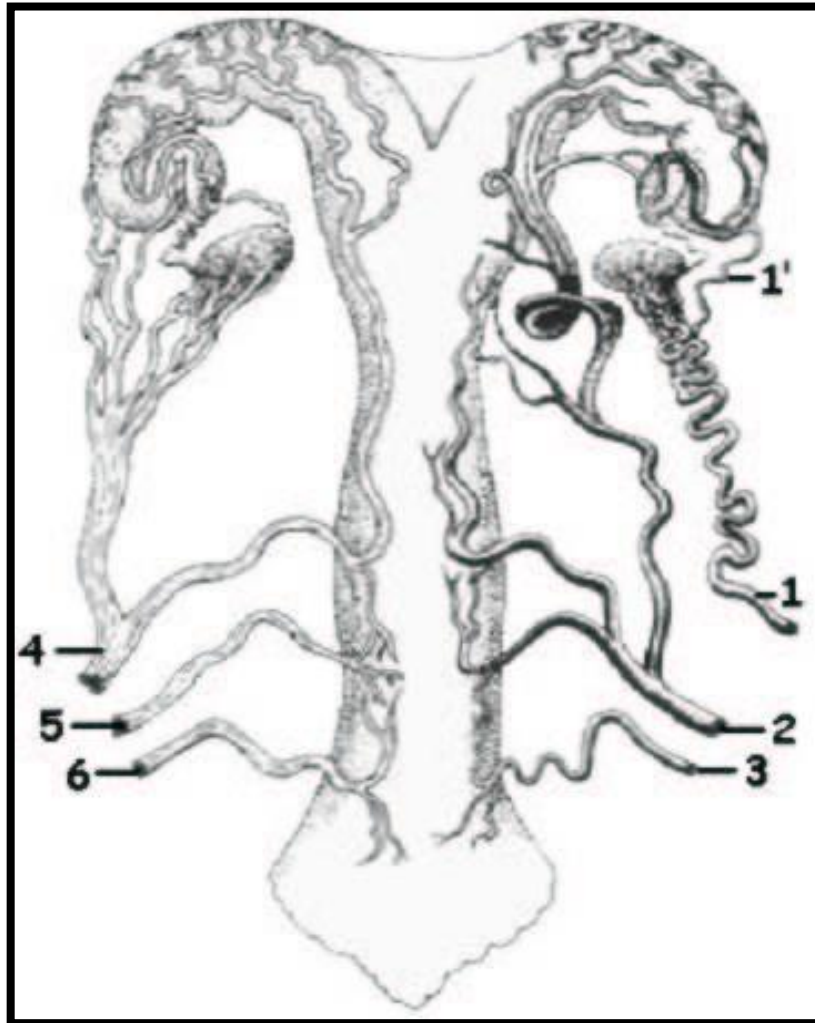
Figure 8 Location of reproductive organs relative to the rectum and urinary bladder. A. Cow, B. Sow, C. Mare, D. Bitch. Note species differences in the anatomy of the cervix and mammary gland(s).



*Figure 9 Genital tract comparisons among some domestic animals. 1, uterine horn; 2, uterine body; 3, cervix; 4, urinary bladder; 5, ureter; 6, urethral opening. The genital tracts are opened dorsally near the body of the uterus, and the opening is extended caudally to the labia to show the cervix and urethral opening. Not that the relative proportions of uterine horns, uterine body, and cervix varies among species. The illustrations are not drawn to scale, therefore the size comparison here would be inaccurate.*

## Blood Supply

- a. Ovarian artery (ovaries and oviducts, cranial part of the uterus)
- b. Uterine artery (the major part of the uterus)
- c. Vaginal artery (vagina).\



*Figure 10 Blood supply to the reproductive tract for the cow. The arteries are shown on the right side and the veins on the left. 1, ovarian artery/ 1' uterine branch; 2, uterine artery; 3, vaginal artery; 4, ovarian vein; 5, uterine vein; 6, vaginal vein.*

