• Genital system

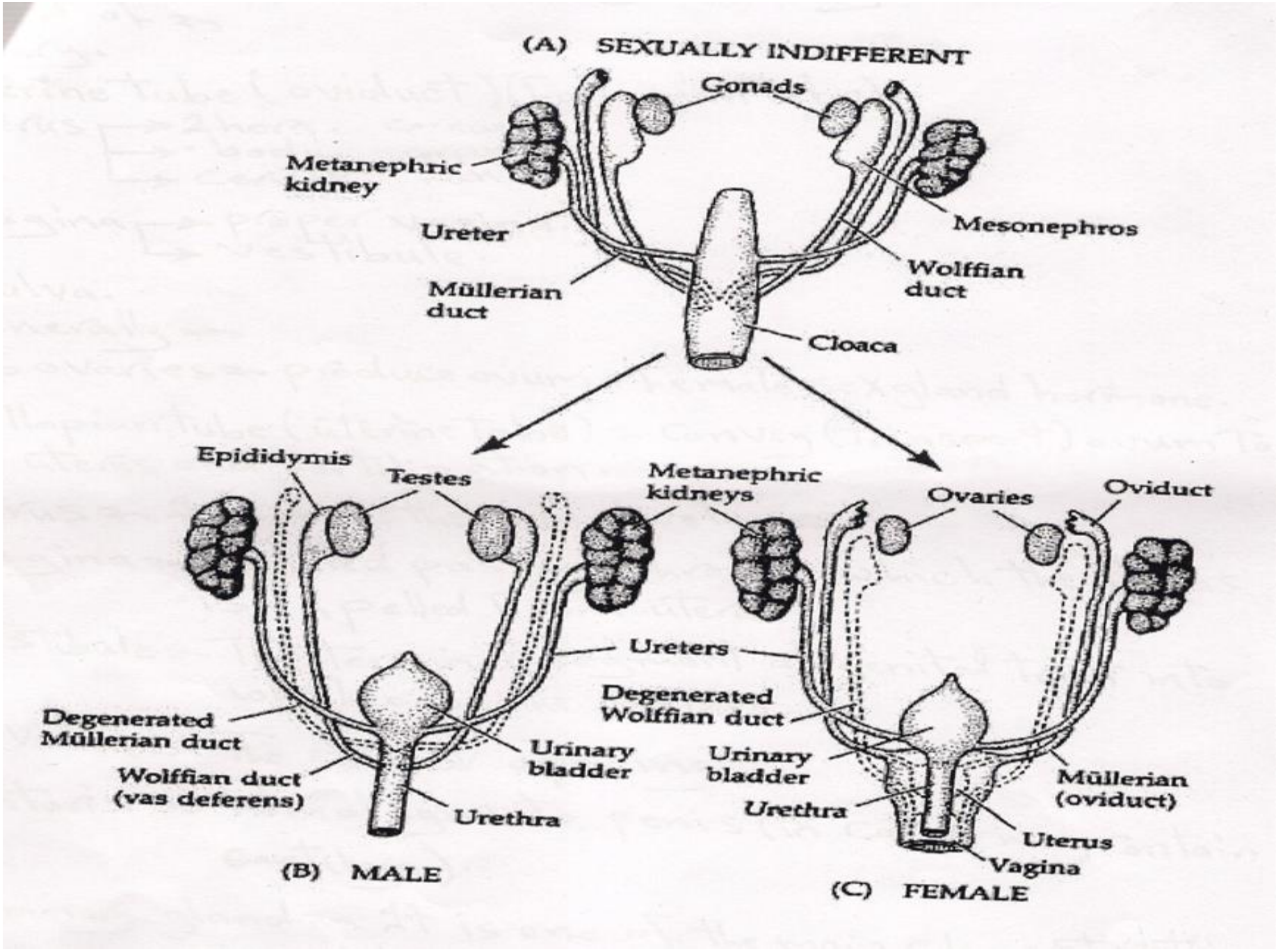
- The development of genital organs:
- The genital organs developed from the mesoderm. The indiffentiate stage, in this stage we cannot differentiate between male and female.
- This stage occurs at the 4th week of pregnancy in the dog and in 6^{th} week in the ruminant. The young embryo exhibit Gonads which at the first give no evidence as to weither they develop into testes or ovary.

There are also two different ducts systems:

Mullerian duct (paramesonephric duct).

Wolf duct (mesonephric duct).

In the embryo develops into female the mullerian duct form the uterine tube, uterus and vagina. The wolf ducts remain rudimentary. While when the embryo develops into male the wolf ducts develops to duct system of the testes.


(A) SEXUALLY INDIFFERENT
Gonads
Metanephric kidney
Ureter
Müllerian duct
Mesonephros
Wolffian duct
Cloaca
Epididymis
Testes
Metanephric kidneys
Ovaries
Oviduct
Ureters
Degenerated Müllerian duct
Wolffian duct (vas deferens)
Urinary bladder
Urethra
Degenerated Wolffian duct
Urinary bladder
Müllerian (oviduct)
Urethra
Uterus
Vagina
(B) MALE
(C) FEMALE

- **"Female genital system"**

- Consist of:
- Ovary.
- Uterine tube (oviduct) (fallopian tube).
- Uterus a) **2** horns b) body c) cervix.
- Vagina a) proper vagina b) vestibule.
- Vulva.
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- **Generally:**
- Two ovaries: produce ovum + female sex gland hormones.
- Fallopian tube (uterine tube): convey (transport) ovum to the uterus and fertilization.
- Uterus: in which the ova develops.
- Vagina: dilated passage through which the fetus is expelled from uterus.
- Vestibule: the terminal segment at genital tract into which open the urethra.
- Vulva: the external opening.
- Clitoris: homologue to penis (in cat it may contain cartilage).
- Mammary gland: it is one of the main characteristic features of mammals, are present in both male and female but reach full development only in the female, they are paired occur in pectoral or thoracic or inguinal or in all these three regions.

- **<u>The ovaries:</u>**
- The ovaries of domestic mammals are oval or round located in the sublumber area suspended by the mesovarium which is a part of the broad ligament, in mesovarium pass the blood and lymph vessels and nerves. The ovary connected to the uterine end by the proper ligament of the ovary.
-

Ovary of mare: they are reproductive gland produce ovum and female sex hormone. They are bean-shaped in large animal but in small animal are oval, have oval fossa.

- The surface covered by peritoneum except the hilus, while the ovulation fossa in free border covered by polygonal cells.
- The right ovary presents **2** cm before than the left, 7-8 cm long, 3-4 cm thick, 70-80 gm weight.
- The stroma is a network of connective tissue, it have numerous number of follicles in various stage. The ovary has **2** surfaces, **2** borders, **2** extremities.
- The surfaces are medial and lateral and both are smooth and rounded.

- The borders:
- **The attached or mesovarial border**, which is convex and enclosed in apart of the broad ligament called mesovarium. The vessels and nerves reach the ovary through this broad ligament.
- **Free border**: it is marked by a notch which leads into a narrow depression (the ovarian fossa).

- **The cranial extremity** is rounded and related to the fimbriated end at uterus tube.
- **The caudal extremity** (uterine extremity) also round and contact with uterus by ovarian ligament.
- **Situation:** the ovary situated in the sublumber region under the 4^{th} or 5^{th} lumber vertebrae and it is attached to the sublumber region by the cranial part of the broad ligament (mesovarian), it is 8-10 cm in wide.

- The follicle: is an oocyte surrounded with one or more layer of epithelium.

1. Primordial follicle.
2. Growing follicle:

- **a)** Primary follicle: is surrounding with one layer of epithelium.
- **b)** Secondary follicle: surrounding with more than one layer of epithelium.
- **c)** Tertiary or vesicular follicle.
- Mature follicle: is transparent vesicle on the ovary, it is about (1-2) cm in diameter. The Ovary of young cow has about (50000)follicles in number decrease to 2500 follicles in cow of 8 years, the total number of the follicles in the

3. **2** ovaries of a normal young adult women about 400,000 but most of them will disappear by atrasia.

- After menopause only small number of follicle remains.
- During the reproductive life of the women (30-40 years), the total number of oocyte librated about (450 ova). When follicle matures it ruptures and discharges the ovum.
- The rupture is depending on:
- Increase in internal pressure of the follicle.
- Enzymatic change.
- Acute hyperemia.
- After the discharge of the ovum, these granulosa cells and the cells of the theca interna, under the influence of the **LH** hormone begin the formation of the corpus luteum which is a temporary endocrine gland.
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- ***Ovary of the cow:***
- About 3-4 cm along and 15-20 gm in weight.
- Oval in shape and has no ovulated fossa.
- Located on the lateral margin of the pelvic inlet and in pregnant more cranial.
- Suspended dorsally to the uterine horns.
- Enveloped by extensive ovarian bursa.
- The corpus luteum project over the surface.

- ***Ovary of the bitch:***
- Elongated flat.
- About **2** cm in long.
- Covered completely with ovarian bursa.
- Located about 2 cm behind the kidney under the 3^{rd}-4^{th} lumber vertebrae.
- It is attached cranially by suspensory ligament to the diaphragm.

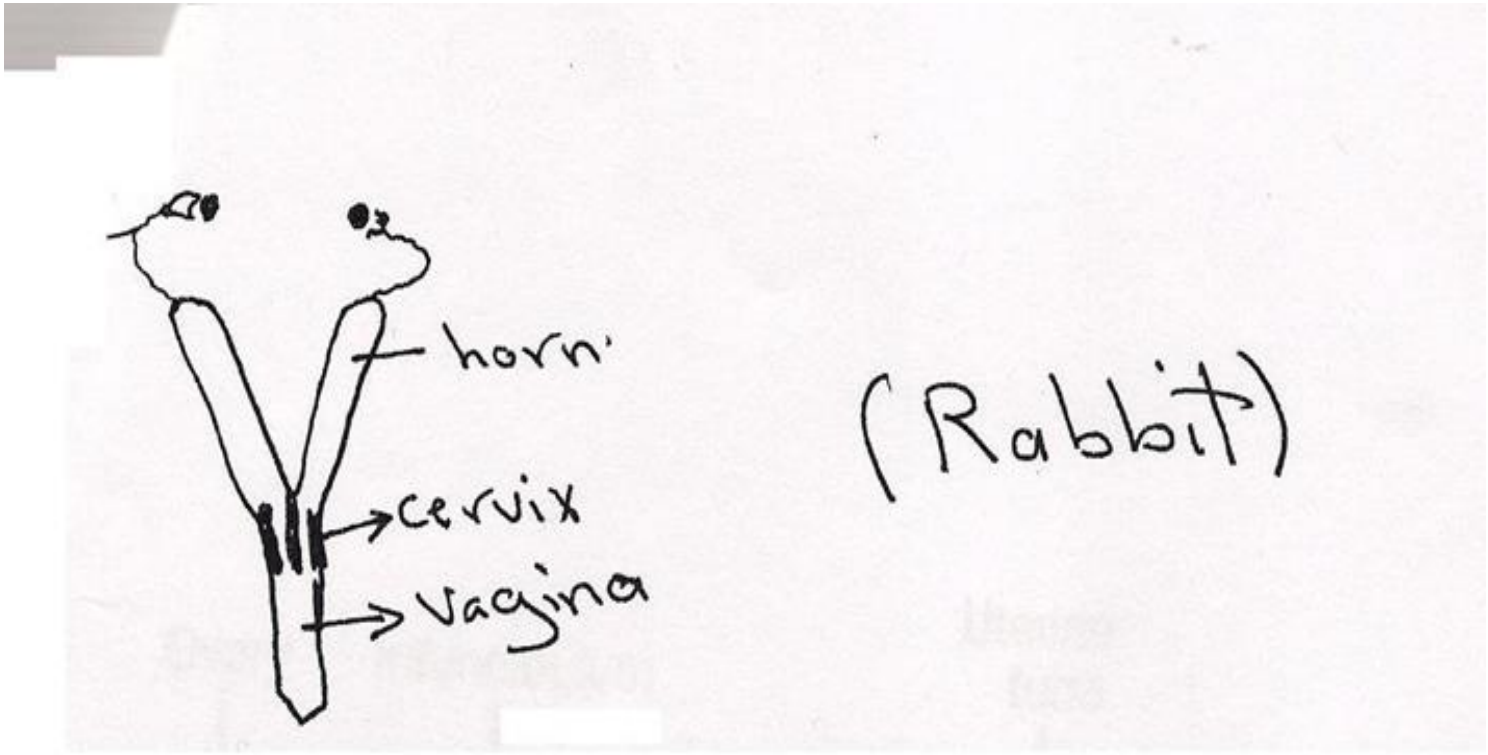
- **Uterine tube:**
- Uterine tube or oviduct is a narrow muscular tube which conveys the ova from the ovary to the uterus.
- The fertilization take place in the uterine tube, the fertilized ovum takes several days to reach the uterus (cow **3-5** days), (dog, horse **8** days), (cat, pig and sheep **3** days).
- The ovarian end of the uterine tube is formed by the funnel shape (infundibulum), near the center of which is a small abdominal opening of the tube.

- The opening leads into the relatively wide segment (**ampulla**) of the uterine tube; the remainder of the tube is the isthmus, which is narrow and just wide enough for the ovum to pass through.
- The uterine tube is very tortuous. It ends at the uterine horn with uterine opening which is in dog and horse is on a small papilla.
- The length of the uterine tube is about (5-9) cm in dog, (15-16) cm in sheep, (25-28) cm in cow, (25-30) cm in horse.
- The free margin of the infundibulum has irregular processes called **fimbria**. The uterine tube is connecting with mesosalpnix.

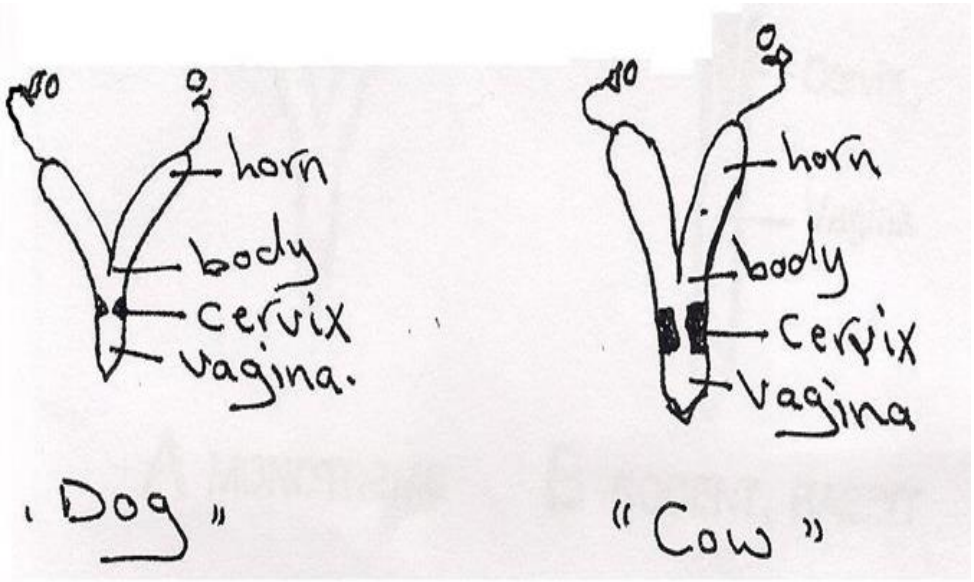
- **Uterus:**
- Is a hollow muscular organ continuous with the uterine tube cranially and open into the vagina caudally. It is situated chiefly in the abdominal cavity but extends shortly into the pelvic cavity.
- It is attached to the sublumber region and the lateral wall of the pelvic cavity by 2 folds of peritoneum termed (broad ligament).
- It is consist of 2 horns, body, neck or cervix. The paramesonephric ducts extends caudally in the lumber area of the embryo, their caudal segment fusing to greater or lesser degree, in the primitive mammals the fusion does not take place, so that vagina and uterus which arise from the caudal segment remain paired, i.e. (vagina duplex and uterus duplex) in the developed mammals, fusion of the caudal segment of the genital ducts and differentiation have occurred, and

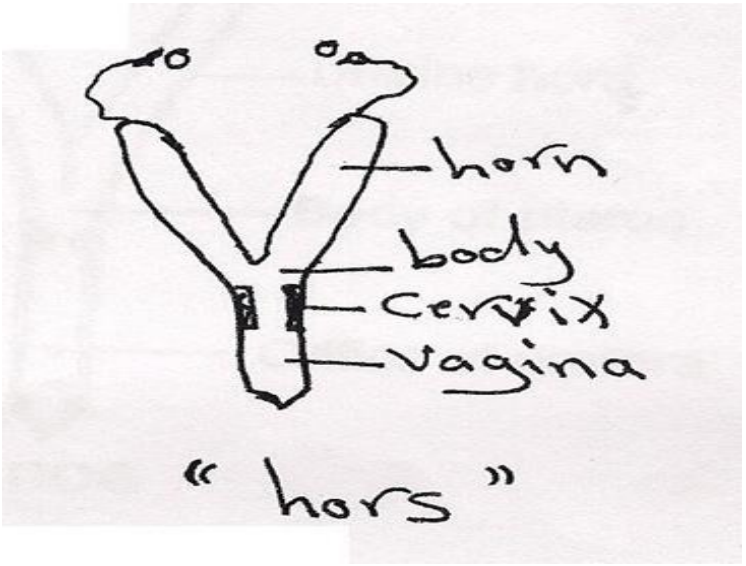
- we find the following types of the uterus:-

1. ***Uterus duplex:*** the uterus is paired and the vagina is single, e.g. (rabbit)

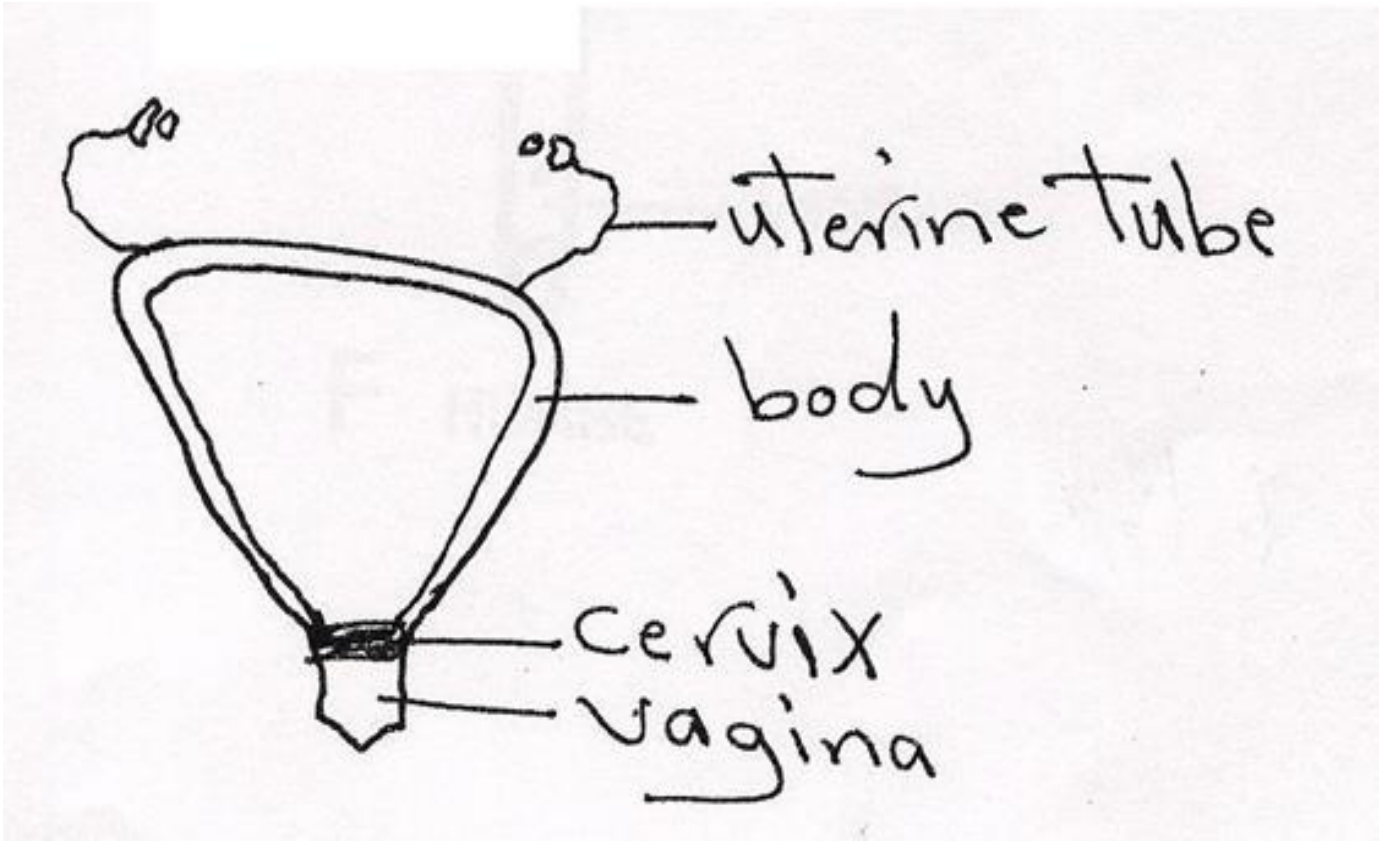


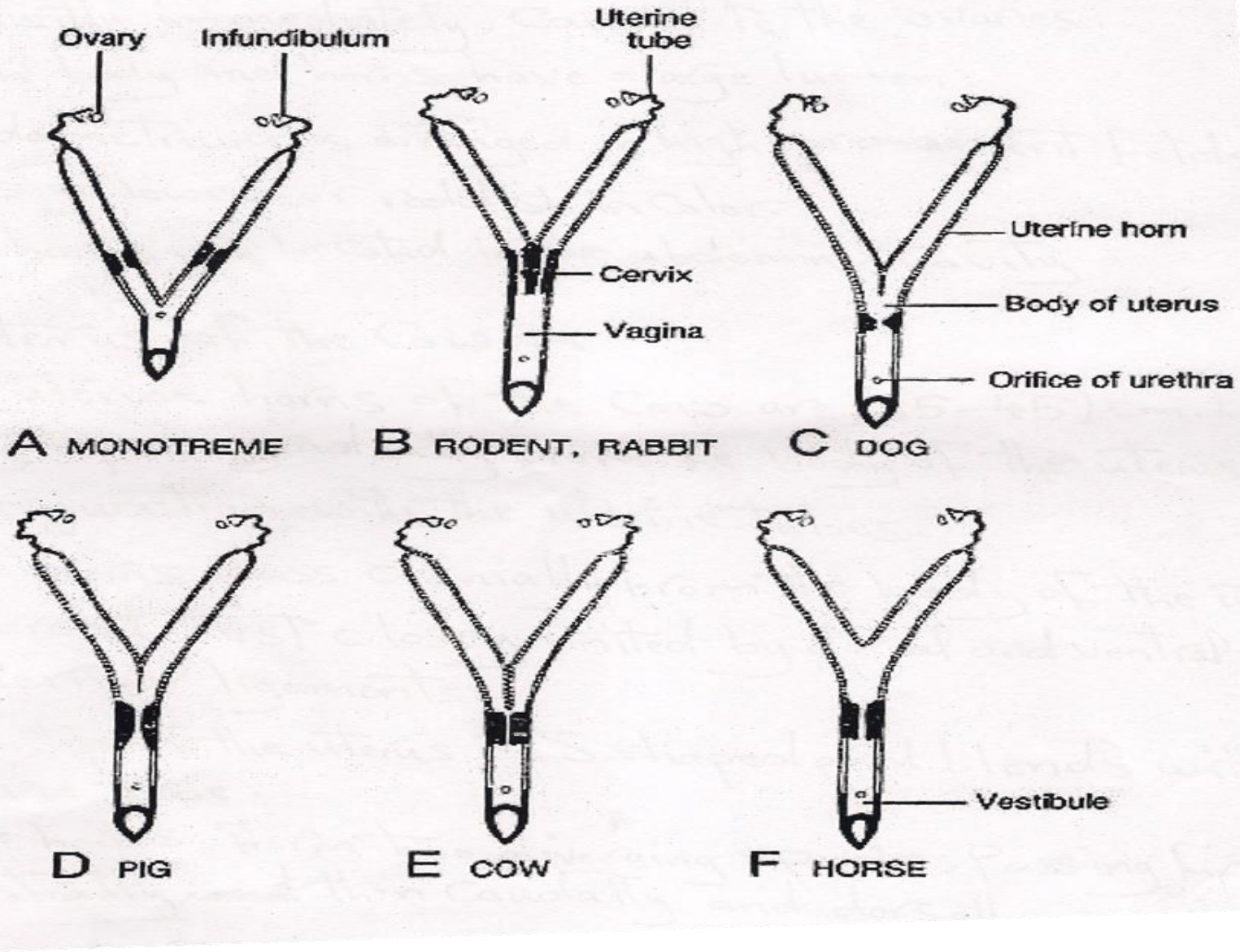
1. ***Uterus bicornis:*** further fusion of the genital ducts result in a common cervix and uterus. e.g. (dog, cow, horse).





- ***Uterus simplex:*** fusion of the genital duct except for their most cranial segments from the uterine tubes. e.g. (in human and other primate).




Ovary
Infundibulum
Uterine tube
Cervix
Vagina
Uterine horn
Body of uterus
Orifice of urethra
Vestibule
A MONOTREME
B RODENT, RABBIT
C DOG
D PIG
E COW
F HORSE

- **The uterus of the mare:**
- Has a large body (22-25) cm long. Tubular horns diverge from the uterine body, the end blunt immediately, caudal to the ovaries. Both body and horns have a large lumen. The endometrium arranged in high permanent folds, it is yellowish or reddish in color.
- The horns are located in the abdominal cavity.
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- **Uterus of the cow:**
- The uterine horns of the cow are (35-45) cm. long.
- They taper gradually from the body of the uterus to their junction with the uterine tubes.
- The horns pass cranially from the body of the uterus and are at first closely united by dorsal and ventral to cornual ligaments.
- The tip of the uterus is **S** shaped and blends with the uterine tube.
- The horns form two diverging spirals, passing first ventrally, then caudally and dorsally
- In the endometrium present caruncles which are oval prominences distributed over the internal surface, they are oval or round.

- **The cervix:** it is the most caudal part of the uterus and connects it to the vagina; it is cylindrical structure with a thick, firm wall, it's function closed the uterus during pregnancy. The cervix extends from the internal uterine orifice to the external uterine orifice.
- The cervix of the mare is firm. The cervical canal has longitudinal folds, it is straight.
- The cervix of the cow is thick-walled, firm tube it is about (10 cm) long. It has transverse and longitudinal folds from the mucous membrane projecting in the lumen of the cervix. The cervical canal is tortuous. The cervix of the bitch is about (1) cm in long. The internal and external orifices are close together. The intravaginal part is project only ventrally in the vagina.
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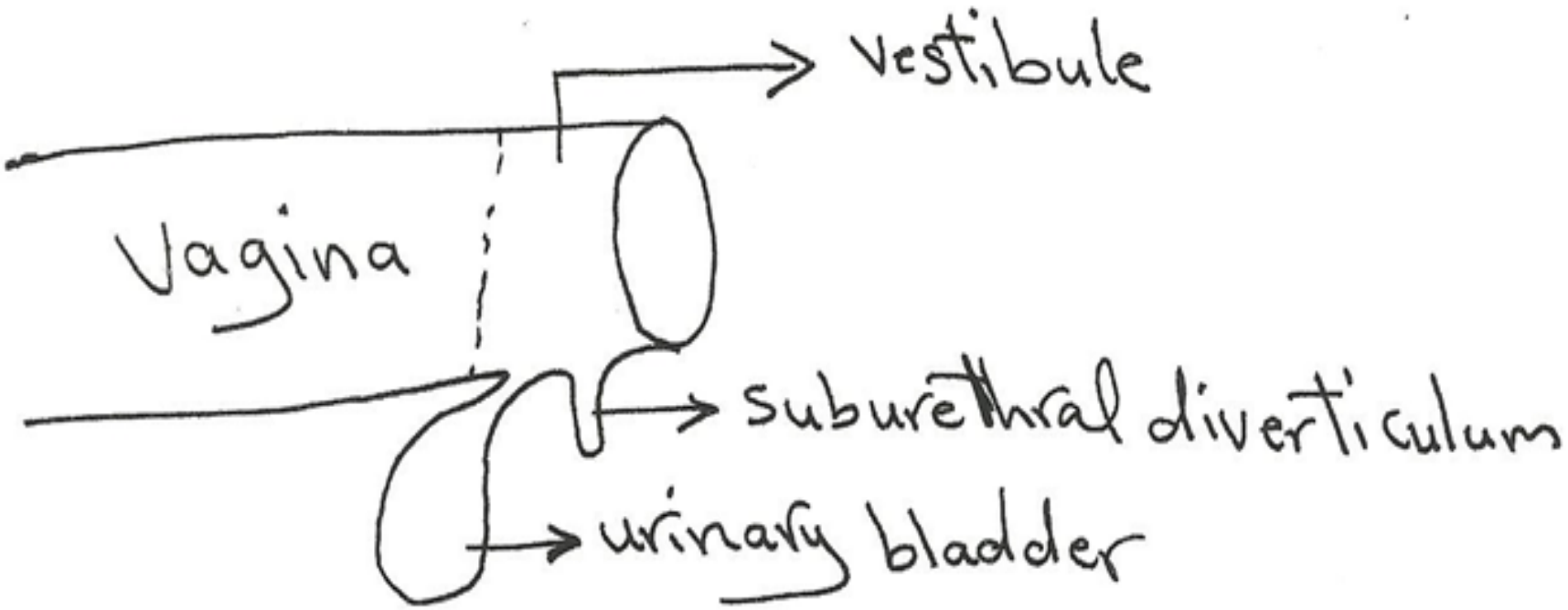
- **The vagina:** the vagina formed from the fusion the caudal parts of the paramesonephric ducts together with vestibule and vulva, it constitute the copulatory organ of the female and it is also important segment of the birth canal. The vagina is relatively thin-walled tube extend longitudinally inside the pelvic cavity and related to the rectum and ventrally to the urinary bladder and urethra. The cranial end of the vagina is occupied by the intravaginal part of the cervix around which is an annular recess known as the **fornix** of vagina. The vaginal wall consists of smooth muscles and lined with nonglandular mucous membrane, arranged in longitudinal folds.

- The junction between vagina and vestibule at the level of the external urethral orifice. In the floor of the genital tract is the hymen.
- The junction is marked by well-developed transverse fold (**the hymen**) which separates between the vagina and vestibule.
- The hymen is poorly developed in animals and is resent in the foal and guinea pig by a low annular fold.
- The vagina is about (15-20) cm in mare and about (25-30) cm in cow, and relatively long in bitch


vestibule
Vagina
suburethral diverticulum
urinary bladder

- **The vestibule of the vagina:**
- It develops from the ventral part of the cloaca. It belongs to both urinary and genital systems. It extends from the level of external urethral orifice to the labia of the vulva.
- In the floor of the vestibule of sow and cow is the entrance to the suburethral diverticulum, which is a short blind pouch ventral to the external urethral orifice. The vestibule is lined with reddish mucous membrane.
- The vestibule is about (10-12) cm in long in mare and short in the cow.

- The mucous membrane of the vestibule contains the following "mucous producing glands":
- Minor vestibular glands (dog, pig, sheep, and horse).
- Major vestibular glands (cow, cat and occasionally in sheep).
- Vestibular bulb (bitch and mare).

- **The vulva:** vulva is the external part of the female genital tract. It consists of right and left labia which meet dorsally in the rounded dorsal commissure and ventrally in the more pointed ventral commissure, the skin of the labia has sebaceous and sweat glands and hair follicles.
- Depending on the species, the skin of the labia is completely or partly or not pigmented black.
- Inside the vulva cleft is lined with mucous membrane. The labia is consist largely of adipose tissue embedded in which the bundles of the constrictor vulvae.

- **The clitoris:** It is homologue of the penis, the main difference being that in the female the urethra is not part of the clitoris, where as in the male the urethra in corporate in the penis. The clitoris consists of two crura and body and glans.
- ***The crura clitordis*** arise from the ischiatic arch.
- ***The glans clitordis*** is at the tip of the body. The clitoris is located in a depression (fossa clitordis) in the ventral commissure. In some species it is covered with the prepuce of the clitoris. The glans clitoris is composed of erectile tissue.
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• Mammary gland

- It is modified cutaneous gland found in both male and female, which is so closely associated functionally with the genital organs also be considered accessory to them (accessory female sex glands), These glands are present in both sexes, but reach full development only in the female, they are paired and located in the pectoral, thoracic or inguinal regions or in all three. The number varies, in cat, bitch and sow possess several pairs of glands in arrow extending from the lower chest to the groin (inguinal), and in the ruminant and mare the glands of the two sides are partly fused to form an **udder** in the pubic region.
- In the mare they are two in number and are placed on two sides of the median plane in the prepubic region. Also considerable variety is found in the number of openings from milk emerges in the teats or nipples.

Species	Usual number of glands	Location of glands	Number of openings in the teats
Cats	10	Inguinal, abdominal and thoracic regions	3-2
Cattle	4	Inguinal	1
Dogs	10	Inguinal, abdominal and thoracic regions	8-20
Goats	2	Inguinal region	1
Horses	2	Inguinal region	2-4
Humans	2	Thoracic region	15-24
Pigs	14	Inguinal, abdominal and thoracic regions	2-3
Sheep	2	Inguinal region	1

- It consists of glandular mass or body of the gland and the papilla or teat, the base is related to the abdominal wall to which it is attached by areolar tissue which contain a venous plexus, mammarian lymph node and a variable amount of fat.

- :
- Because they are so large and specialized, a cow's mammary glands, commonly known as the udder.
- Mammary gland consists from mamma (glandular structure) and teat.
- Lobes: the internal compartments of the mamma, separated by adipose tissue (fat). The lobes are divided into lobules. Lobules consist of tissue containing alveoli, the grape-like clusters of milk-secreting cells of the mammary gland.
- Milk ducts (lactiferous ducts): large ducts convey milk from the alveoli to the milk sinus.
- Milk sinus (lactiferous sinus): the large milk storage cavity within the teat and the glandular body.
- Teat or papilla: the projecting part of the mammary gland containing part of the milk sinus.
- Teat canal (papillary duct or streak duct): the duct extend from teat sinus to the teat opening.
- Teat openings: the openings of the teat canal.
- Sphincter muscle: it is the muscular fibers around the teat opening that prevent milk flow, except during sucking or milking.

- Mammary gland of the cow is four in number each one called (**quarter**). They are much larger than in mare. Each quarter is a completely separate unit from the other three and each one has it's own milk-secreting system and ducts leading down to their own teats. The base of each gland is concave in adaptation the abdominal wall to which it is attached by means of well developed **suspensory apparatus** to support the heavy weight and attach the udder to the abdominal wall, which is extend caudally and is attached to the pelvic symphysis by mean of the strong plate of tendinous tissue. This plate of tissue attached the repubic tendon to the ventral part of symphysis.

- **The suspensory apparatus** consist from (**4**) sheaths of tissue, two of them are well developed and median (or medial) in position and consist from yellow elastic tissue. The two glands are separated by this double septum which attaché to the median flat surface of each gland.
- The lateral sheath (collagenous sheets) arises from the symphysial tendon caudal to the udder (which attached to the pelvic symphysis). They extend ventrally over the udder and divided into superficial which attach to the skin, and the other is deep which attaching to the lateral surface of the gland.

In the cow there are (**4**) developed teats (**7-8** cm).

- The udder is dividing into four quarters; there is no septum between the two on the same side

note

- Primary laminae which they are four sheets of connective tissue applied to the lateral and medial sides of each half of the udder and meeting at the teats to form the capsule of the udder, while the secondary laminae are seven to ten sheets arising from the primary laminae to enter the mammary gland and divided it into lobes.
- Each teat has a single lactiferous duct which widen dorsally into lactiferous sinus, the lower part of the duct is narrow and closed by sphincter and elastic tissue

Mammary gland

↓

Gland

↓

Lobe

↓

Lobules (secretary acini, -acini and alveoli-)

↓

Lactiferous duct

↓

Lactiferous sinus

↓

Teat canal

↓

Teat opening

end