PATHOLOGY OF GENITAL SYSTEM

- Female Genital System
  - Developmental anomalies
  - Cystic ovaries
  - Oophoritis
  - Salpingitis
  - Metritis
  - Pyometra
  - Endometritis
  - Cervicitis
  - Vaginitis
  - Abortion
  - Placentitis
  - Mastitis

- Male genital system
  - Developmental anomalies
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  - Epididymitis
  - Funiculitis
  - Seminal vesiculitis
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  - Balanoposthitis

- Model Questions
FEMALE GENITAL SYSTEM

DEVELOPMENTAL ANOMALIES

Agenesis
Absence of ovary, uterus, oviduct and cervix in females. It may be unilateral or bilateral.

Hypoplasia
Complete or partial lack of germ cells in ovaries. Hypoplasia of uterus is related with agenesis of gonads. Ovaries of freemartin are also hypoplastic. Hermaphrodite animal has ovary and testicular tissue both in the gonads.

Hermaphroditism
In hermaphrodites, there is presence of organs of both sexes in same individual animal. Both ovarian and testicular tissue occur in one animal leads to sterility in animal (true hermaphrodite) while in pseudohermaphrodite the gonadal tissue of only one sex is present but there is some degree of development of opposite sex organs.

Uterus unicornis
Uterus unicornis is presence of only one horn of uterus instead of two, seen in animals with white heifer disease.

White heifer disease
White heifer disease occurs due to a single sex linked gene defect responsible for white coat colour. In such animals, there are normal ovaries, oviduct but uterus is incomplete and may lack communication with cervix. There is hypoplasia of cervix and vagina.

Uterus didelphys
Uterus didelphys is the occurrence of two cervix with two uterine bodies and single or double vagina. It occurs due to failure of Mullerian ducts to fuse at their distal end. Sometimes failure of fusion may affect only cervix and there is two cervix which is termed as Cervix bifida.

CYSTIC OVARIIES
Cystic ovaries are defined as an ovary, which contains one or more clear cysts ranging from one to several centimeters in size (Fig. 19.1).

Etiology
• Hormonal imbalance

Macroscopic features
• Presence of cysts in ovaries.
• Hormonal imbalance of animal leads to sterility, continuous estrus, nymphomania due to follicular cyst.
• Lutein cysts may cause pyometra leading to pseudopregnancy.

Microscopic features
• Follicular cyst
• Ova absent several layers of granulosa or a single layer of epithelium.
• Many follicular cysts are present.
• Lutein cyst covered by fat containing granulosa cells.

OOPHORITIS
Oophoritis is the inflammation of ovary caused by trauma, infection and characterized by granulomatous or lymphocytic inflammation of ovary (Fig. 19.2 to 19.4).

Etiology
• Mycobacterium tuberculosis
• Herpes virus

Macroscopic features
• Hard, nodular lesions in ovary, encapsulated with fibrous tissue.

Microscopic features
• Granuloma of tuberculosis through hematogenous infection.
• Infiltration of lymphocytes leading to lymphofollicular reaction in follicles.
• Atrophy or absence of ova.
Fig. 19.1 Photomicrograph showing cystic ovary (ARS/USDA)

Fig. 19.2 Photograph showing oophoritis and salpingitis

Fig. 19.3 Photomicrograph showing oophoritis

Fig. 19.4 Photomicrograph showing oophoritis

Fig. 19.5 Photomicrograph showing metritis

Fig. 19.6. Photograph showing prolapse of vagina

Fig. 19.7 Photomicrograph showing oedema and congestion in placenta (Placentitis) due to brucellosis

Fig. 19.8. Photomicrograph showing fungal placentitis (ARS/USDA)
**SALPINGITIS**

Salpingitis is the inflammation of oviduct or fallopian tube characterized by congestion, catarrhal or purulent exudate leading to distended lumen (Fig. 19.2).

**Etiology**
- Mycoplasma
- Streptococci
- Tuberculosis (*Mycobacterium tuberculosis*)
- Trichomoniasis (*Trichomonas foetus*)

**Macroscopic features**
- Congestion, abscess formation
- Distension of oviduct lumen due to accumulation of serous exudate which is known as *Hydrosalpinx*.
- Accumulation of pus in oviduct is termed as *Pyosalpinx*.
- Fibrosis, hardness
- Occlusion of lumen due to inflammatory exudate resulting in sterility.
- Inflammatory exudate is toxic to ova as well as sperms leading to sterility.

**Microscopic features**
- Congestion
- Suppurative inflammation
- Infiltration of neutrophils, macrophages and lymphocytes
- Proliferation of fibrous tissue
- Debris of desquamated cells

**METRITIS**

Metritis is the inflammation of uterus characterized by suppurative exudate, haemorrhage and necrosis of uterus (Fig. 19.5).

**Etiology**
- *Actinomyces pyogenes*
- *E.coli*
- Staphylococci
- Streptococci
- *Trichomonas foetus*
- *Campylobacter foetus*

**Macroscopic features**
- Congestion, catarrhal or purulent exudate
- Haemorrhage
- Enlargement, oedema
- Oozing out of pus from uterus on pressure

**Microscopic features**
- Seropurulent exudate in uterine wall.
- Oedema
- Infiltration of macrophages and lymphocytes
- Desquamation of lining epithelium

**PYOMETRA**

Pyometra is an acute or chronic suppurative inflammation of uterus resulting in accumulation of pus in the uterus.

**Etiology**
- Occurs under the influence of progesterone.
- *E. coli*
- *Actinomyces pyogenes*
- *Proteus spp.*
- *Staphylococcus aureus*
- *Trichomonas foetus*

**Macroscopic features**
- Discharge of thin cream like pus from vulva soiling the tail and perineal region.
- Pus discharge is more on sitting position of animal.
- Enlargement of abdomen due to distension of uterus.
- Uterus looking like as pregnant uterus as a result of accumulation of pus. This condition is also known as *Pseudocyesis* or *pseudopregnancy*.
- Retention of lutein cyst.

**Microscopic features**
- Congestion, infiltration of neutrophils, lymphocytes and plasma cells.
- Necrosis of mucosal epithelium of uterus.
- Proliferation of endometrial epithelium.
- Oedema, glandular hyperplasia.
ENDOMETRITIS
Endometritis is the inflammation of endometrium, the mucosa of uterus. It may be catarrhal or purulent and may occur after metritis.

**Etiology**
- *Trichomonas foetus*
- *Campylobacter foetus*
- Staphylococci
- Streptococci
- Organism enters in uterus as a result of coitus, artificial insemination or as iatrogenic infection.
- Strong chemicals/medicines administered in uterus.

**Macroscopic features**
- Catarrhal discharge from uterus containing desquamated cells.
- Sterility due to toxic environment of uterus to sperms.
- Congestion.

**Microscopic features**
- Congestion
- Moderate infiltration of lymphocytes, plasma cells and neutrophils in mucosa.

CERVICITIS
Cervicitis is the inflammation of cervix as a result of either descending infection from uterus or ascending infection from vagina and characterized by catarrhal inflammation.

**Etiology**
- Etiological agents are similar as in endometritis.

**Macroscopic features**
- Congestion
- Enlargement of cervix.

**Microscopic features**
- Catarrhal inflammation of cervical mucosa.
- Hyperplasia of mucous glands with tall mucin containing epithelial cells.
- Presence of mucin in lumen.

VAGINITIS
Vaginitis is the inflammation of vagina characterized by congestion, granularity as a result of elevations in mucosa. This is also known as *infectious pustular vulvovaginitis* in cattle caused by herpes virus.

**Etiology**
- *Mycoplasma bovigenitalium*
- Bovine herpes virus-1 (BHV-1)
- Picorna virus
- *Trichomonas foetus*

**Macroscopic features**
- Granular elevation in vaginal mucosa.
- Congestion
- Prolapse due to limitation (Fig. 19.6).

**Microscopic features**
- Accumulation of lymphocytes in sub epithelial region.
- Congestion

ABORTION
Abortion is expulsion of dead embryo or foetus before attaining normal gestation. There are two other terms related to abortion i.e. stillbirth and premature birth. *Stillbirth* is defined as expulsion of dead foetus on its full maturity while *premature birth* is birth of a live foetus before attaining full gestation period.

**Etiology**
- Brucellosis (*Brucella abortus, B. meletensis, B. ovis*)
- *Campylobacter foetus*
- *Salmonella abortus-equid- mares*
- Equine herpes virus- mares
- Bovine herpes virus-1- cattle
- *Chlamydia psittaci*
- *Trichomonas foetus*
- *Listeria monocytogenes (Listeria ivanovii)*
- *Leptospria spp.*
- *Mycobacterium tuberculosis*
- *Toxoplasma gondii*
• Mycoplasma mycoides
• Fungi- Aspergillus spp., Coccidioides spp., Absidia spp.
• Toxins / poisons

Macroscopic features
• Expulsion of dead foetus in early stage (3-4 month) of gestation (Trichomoniasis)
• Abortion in middle of gestation (Campylobacteriosis).
• Late abortions (7-9 months) occur due to Brucellosis, BHV-1 infection.
• Liver of foetus has necrotic foci, congestion.
• Stomach contents used for confirmation of etiology.
• In some cases of abortion, there is retention of placenta (e.g. Brucellosis)
• Placenta becomes oedematous and necrotic (Placentitis)
• If the foetus becomes dead and not expelled outside the body due to non-opening of cervix, the dead foetus remains in uterus under sterile conditions. Such foetus undergoes autolysis and liquefied. Liquid material is absorbed in uterus through lymph or blood and bones/skin etc. remain in uterine horn sometimes causing irritation or damage to endometrium. Such foetus becomes shrunken with wrinkled skin and dried as mummy and are known as “Mummified foetus”.

Microscopic features
• Necrotic hepatitis with lymphofollicular reaction in foetus (Brucellosis, BHV-1 infection).
• Granulomatous lesions (tuberculosis, fungal infection), lymphofollicular reaction (mycoplasma, chlamydia).
• Demonstration/isolation of causative organisms in foetal stomach contents.
• Liver of foetus icteric (leptospirosis)
• Endometritis in dam.
• Bronchopneumonia in foetus e.g. brucellosis.

RETAINED PLACENTA/PLACENTITIS
Retention of placenta occurs after abortion or parturition as a result of inflammation characterized by swelling, oedema or fibrosis which prevent the separation of chorion from endometrium (Fig. 19.7 & 19.8).

Etiology
• Lack of progesterone
• Infection e.g. Brucellosis, Trichomoniasis.

Macroscopic features
• Retained placenta undergoes autolysis, putrefaction
• Toxaemia in dam.
• Endometritis, Pyometra

Microscopic features
• Placenta is oedematous and congested
• Infiltration of neutrophils, mononuclear cells.
• Proliferation of fibroblasts.

MASTITIS
Mastitis is the inflammation of mammary gland characterized by oedema, haemorrhage and fibrosis of udder. Mastitis is always infectious and is a disease of lactating glands. There is no hematogenous infection and infections enter through teat canal to cause mastitis (Fig. 19.9 to 19.12).

Etiology
• Bacteria e.g. Streptococcus agalactiae, Streptococcus dysgalactiae, Staphylococcus aureus, Actinomyces pyogenes, Pseudomonas aeruginosa, Brucella abortus, Mycobacterium tuberculosis, E. coli, Pasteurella multocida and many more.
• Virus e.g. FMD virus, pox virus, BHV-1
• Mycoplasma e.g. Mycoplasma mycoides
• Fungi e.g. Candida albicans, Trichosporon spp. Nocardia asteroids, Cryptococcus neoformans.

Macroscopic features
• Oedema of udder
Fig. 19.9. Photograph showing mastitis due to fusarium toxicosis

Fig. 19.10. Photograph showing chronic granulomatous mastitis (ARS/USDA)

Fig. 19.11. Photomicrograph showing chronic granulomatous mastitis (ARS/USDA)

Fig. 19.12 Photomicrograph showing mycoplasmal mastitis

Fig. 19.13. Photograph showing orchitis in a ram

Fig. 19.14. Photograph of testicles showing (A) normal (b) Acute orchitis.

Fig. 19.15. Photograph of testicles of poultry showing orchitis due to salmonellosis

Fig. 19.16. Photomicrograph showing orchitis
Flakes (coagulated milk proteins) in milk.
- Blood mixed milk
- Watery dirty grey or dark colour milk in animals, which are in dry period caused by *Actinomyces pyogenes* and is known as “summer mastitis”.
- Terminal atrophy or shrunken quarter
- Gangrene formation

**Microscopic features**
- Congestion, haemorrhage
- Infiltration of neutrophils, macrophages, lymphocytes
- Necrosis of alveolar epithelium, hyperplasia of epithelial lining.
- Proliferation of fibrous tissue
- Increase in WBC count in milk (more than 100/ml milk).

**MALE GENITAL SYSTEM DEVELOPMENTAL ANOMALIES**

**Testicular hypoplasia**
Testicular hypoplasia occurs in animals with chromosomal abnormality such as XXY chromosomes or Klinefelter’s syndrome. Hypoplasia is also seen in hermaphrodites and in animals with cryptorchidism.

**Spermatocele**
There is failure of development of mesonephric tubules and does not connect with vas deferens resulting into blind tubules filled with spermatozoa. Rupture of tubules may lead to spermatic granuloma.

**Cryptorchidism**
The testicle fails to descend in scrotum through inguinal canal after birth and remains in abdominal cavity. This permanent retention of testicles in abdominal cavity causes their hypoplasia leading to lack of spermatogenesis. Such testes are more prone for development of neoplastic growth.

**Phimosis**
Phimosis is the failure of extension of penis from its sheath.

**Paraphimosis**
Paraphimosis is the failure of withdrawal of extended penis.

**Hypospadias**
In hypospadias, there is urethral opening in ventral side of the penis.

**Epispadias**
There is utrheal opening on the dorsal side of the penis.

**Phallocampsis**
Phallocampsis is the deviation of penis, which may be spiral (Cork screw penis) or ventral deviation (rainbow penis).

**ORCHITIS**
Orchitis is the inflammation of testes characterized by oedema, necrosis and infiltration of neutrophils, macrophages, lymphocytes and proliferation of fibrous tissue leading to atrophy in chronic cases (Fig. 19.13 to 19.16).

**Etiology**
- *Brucella* spp.
- *Campylobacter* spp.
- *Salmonella* spp.
- *Trichomonas* spp.
- *Corynebacterium pseudotuberculosis*
- *Actinomyces pyogenes*
- *Pseudomonas aeruginosa*
- *Actinomyces bovis*

**Macroscopic feature**
- Enlargement of testes, oedema.
- Accumulation of serus fluid in scrotal sac/tunica vaginalis is called as hydrocele.
- Enlargement of scrotum.
- Congestion
- Atrophy and hardening in chronic cases.
**Microscopic features**
- Congestion
- Infiltration of neutrophils and mononuclear cells
- Necrosis of germinal cells
- Proliferation of fibrous tissue and infiltration of mononuclear cells.
- Granulomatous lesions in case of actinomycosis and tuberculosis
- Aspermatogenesis

**EPIDIDYMIS**
Epididymitis is the inflammation of epididymis characterized by catarrhal or suppurative exudate with necrosis of lining epithelium.

**Etiology**
- *Brucella ovis* in sheep
- Other organisms that cause orchitis which is preceded by epididymitis

**Macroscopic features**
- Enlargement of epididymis
- Oedema of scrotum
- Accumulation of mucus and/or purulent exudate in epididymis.
- Accumulation of serus exudate in scrotum.

**Microscopic features**
- Necrosis of lining epithelium of epididymis
- Infiltration of neutrophils, macrophages and lymphocytes
- Oedema
- Formation of granuloma in chronic cases.

**Funiculitis**
Funiculitis is inflammation of scirrhous cord characterized by enlargement of scrotum due to chronic abscess.

**Etiology/Occurrence**
- Botryomycosis
- Actinomycosis
- Castration
- Unsanitary conditions

**Macroscopic features**
- Enlargement of scrotum
- Hard swelling/chronic abscess

**Microscopic features**
- Chronic hyperplastic/proliferative changes
- Fibroplasia
- Infiltration of macrophages, lymphocytes, neutrophils around sulfur granules forming rosette.

**SEMINAL VESICULITIS**
Seminal vesiculitis is the inflammation of seminal vesicle characterized by metaplasia of the columnar epithelial lining to cornified stratified squamous epithelium.

**Etiology**
- *Pseudomonas aeruginosa*
- *Chlamydia psittaci*
- *Mycoplasma bovigenitalium*
- *Actinomyces pyogenes*
- *Corynebacterium renale*
- *Brucella abortus*
- *E. coli*

**Macroscopic features**
- Melanosis in bulbourethral glands.
- Enlargement/hardness of seminal vesicle

**Microscopic features**
- Metaplasia of columnar epithelium into severely cornified stratified squamous epithelium.
- Proliferation of melanoblasts/melanocytes.

**Prostatitis**
Prostatitis is the inflammation of prostate gland by formation of painful abscess, atrophy, hyperplasia of epithelial cells, proliferation of fibroblasts and formation of cysts. It occurs in dogs.

**Etiology**
- Hormonal imbalance
- Pyogenic staphylococci, streptococci
Macroscopic features
- Presence of abscess encapsulated by fibrous tissue
- Enlargement of prostate causing obstruction of urethra
- Obstruction in rectal passage
- Hematuria

Microscopic features
- Infiltiration of neutrophils and liquefied necrosis.
- Chronic inflammation is characterized by hyperplasia of glandular epithelium, fibroblasts and smooth muscle fibers.
- Cystic glandular hyperplasia.
- Infiltiration of lymphocytes.

**Balanoposthitis**
Balanoposthitis is the inflammation of prepuce and glans penis characterized by phimosis or paraphimosis and pain during copulation. Balanitis is inflammation of glans penis and posthitis is inflammation of prepuce.

**Etiology**
- *Trichomonas foetus*
- BHV-1 virus
- Vesicular exanthema virus
- *Mycoplasma* spp.
- *Pseudomonas aeruginosa*
- *Actinomyces pyogenes*
- *Corynebacterium renale*

Macroscopic features
- Phimosis and paraphimosis due to pain, adhesions
- Congestion

Microscopic features
- Fibrinopurulent exudate
- Lymphocytic infiltiration, congestion.

**MODEL QUESTIONS**

**Q. 1. Fill in the blanks with suitable word(s).**
1. Cystic ovary occurs due to.............imbalance and characterized either by.............cyst manifested by.............,............. and.............or.............cyst that leads to.............confused with.............
2. Pyometra is.............inflammation of uterus characterized by accumulation of.............in uterus under the influence of.............hormone secreted by.............
3. Endometritis is mostly characterized by.............inflammation.
4. Early abortions in cattle are caused by.............while late abortions are caused by.............and.............
5. Fungal infection causes.............inflammation of placenta that leads to abortion and.............formation in foetal river.
6. Infectious vulvovaginitis is caused by.............which is transmissible to male counter part through coitus and characterized by.............and jointly this disease is known as.............

**Q. 2. Write true or false against each statement. Correct the false statement.**
1. ........Mastitis is caused by chemical poisons.
2. ........Acute placentitis leads to abortion.
3. ........Hypoplasia of cervix and vagina is seen in uterus unicornis.
4. ........Pseudocyesis is seen during endometritis.
5. ........Brucellosis causes early abortion in cows.
6. ........Salpingitis may cause death of sperms and zygote.
7. ........Balanitis may cause vaginitis through coitus.
8. ........Hematogenous infection of *Pasteurella multocida* infection causes mastitis.
9. ........Retention of placenta occurs in trichomoniasis.

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10. Rainbow penis is seen as a developmental defect characterized by spiral shape of the penis.

Q. 3. Define the followings.

1. Uterus unicorns 14. Cervicitis
2. Vulvovaginitis 15. Mummified foetus
3. Hydrosalpinx 16. Hypospadias
4. Still birth 17. Uterus didelphys
5. Pseudohermaphrodite 18. Shrunken udder
6. Pseudocyesis 19. Pseudopregnancy
7. Placentitis 20. Phallocampsis
9. Cervice bifida 22. Funiculitis
10. Spermatocoele 23. Balanitis
11. Pyosalpinx 24. Posthitis
12. Phimosis 25. Corkscrew penis
13. Epispadias

Q. 4. Write short notes on.

1. Cystic ovary 6. Cryptorchidism
2. Pyometra 7. Orchitis
3. Endometritis 8. Prostatitis
4. Late abortions 9. Mastitis
5. Summer mastitis 10. Epididymitis

Q. 5. Select most appropriate word(s) from the four options given against each statement.

1. Cryptorchidism may lead to ............... of testicles.
   (a) Hypoplasia  (b) Aspermatogenesis  (c) Neoplasia  (d) All of the above
2. Ventral deviation of penis is known as ...............  
   (a) Corkscrew penis  (b) Phallocampsis  (c) Rainbow penis  (d) None
3. Hydrocele is accumulation of serus fluid in ...............  
   (a) Oviduct  (b) Testes  (c) Mammary gland  (d) Tunica vaginalis
4. Funiculitis is the inflammation of ...............  
   (a) Schirrhous cord  (b) Seminal vesicle  (c) Glans penis  (d) Prepuce
5. Phimosis is caused by ...............  
   (a) Balanitis  (b) Posthitis  (c) Balanoposthitis  (d) All of the above
6. Presence of follicular cysts in ovary may lead to ...............  
   (a) Sterility  (b) Nymphomania  (c) Continuous oestrus  (d) All of the above
7. Inflammation of oviduct leads to sterility due to ............... nature of the exudate to sperms.  
   (a) Toxic  (b) Obstructive  (c) Penetrative  (d) None
8. Mastitis is mostly caused by ...............  
   (a) Trauma  (b) Hematogenous infection (c) Toxins/poisons  (d) Infection
9. Summer mastitis is caused by ...............  
   (a) Staphylococci  (b) Actinomyces pyogenes  (c) Streptococci  (d) Candida albicans
10. Parturition of a dead foetus on its full development and gestation is termed as ...............  
    (a) Abortion  (b) Still birth  (c) Premature birth  (d) Normal birth