# Pathology of Female genital sytem

# Non gravid uterus

- **Congenital abnormalities:**
  - **Aplasia**
  - **Uterus unicorns (absence of one uterine horn)**
  - **Segmental aplasia**
  - **Uterus didelphys (double cervix + divided u. body)**
  - **Duplication of uterine horns**
  - **Uterine hypoplasia**

# Aplasia of The Tubular Genitalia (White Heifer Disease)

White heifer disease is a condition in which the embryonic development of the uterus, cervix, and anterior vagina of the heifer is arrested in varying degrees, and with which there may also be obstruction of the vaginal canal from the presence of abnormally developed hymen - The condition is most common in white heifers of the "Shorthorn breed" (normally of mixed red and white colour)

**Cause:**

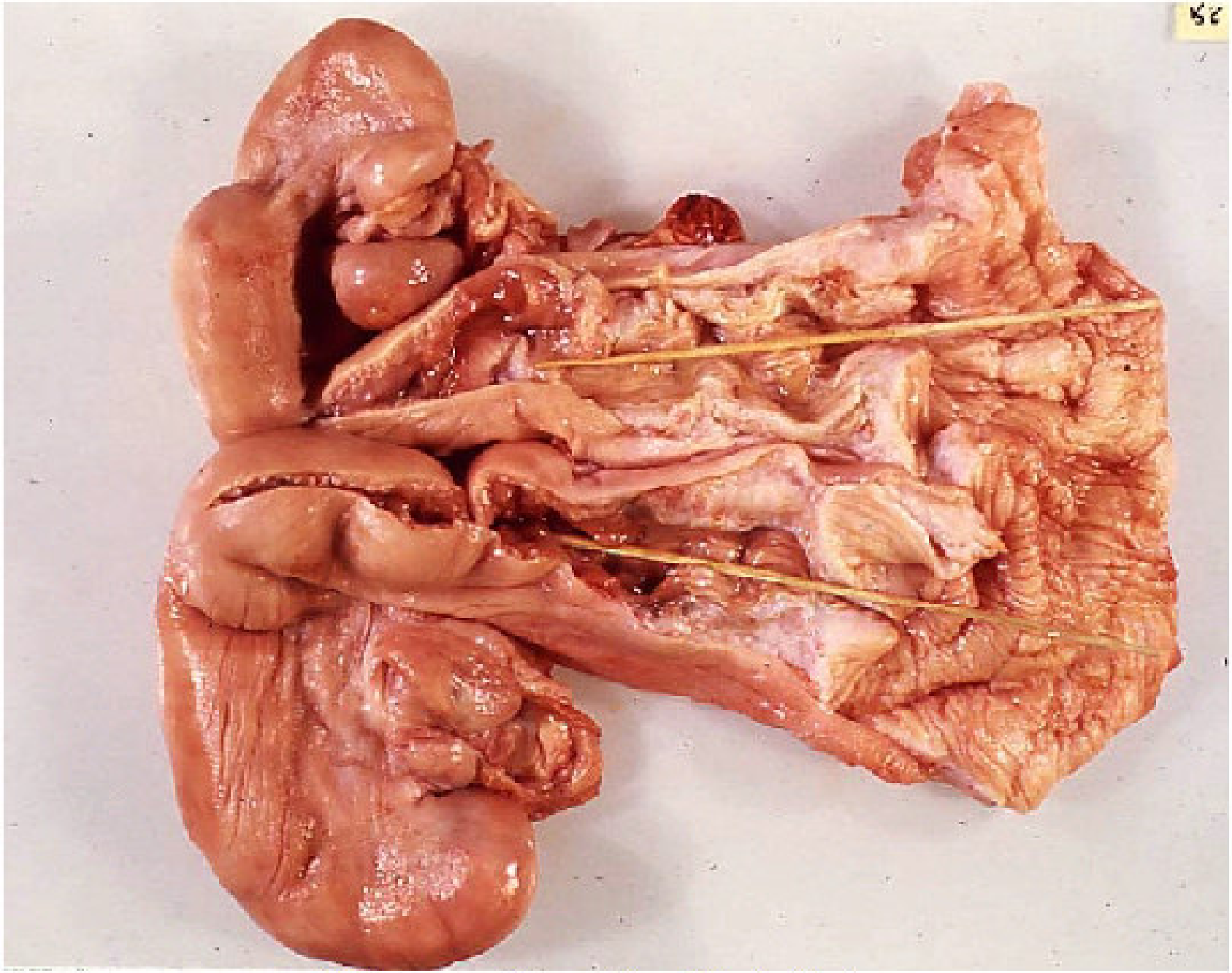
= Hereditary due to gene for white coat colour in females.

**Gross appearance:**

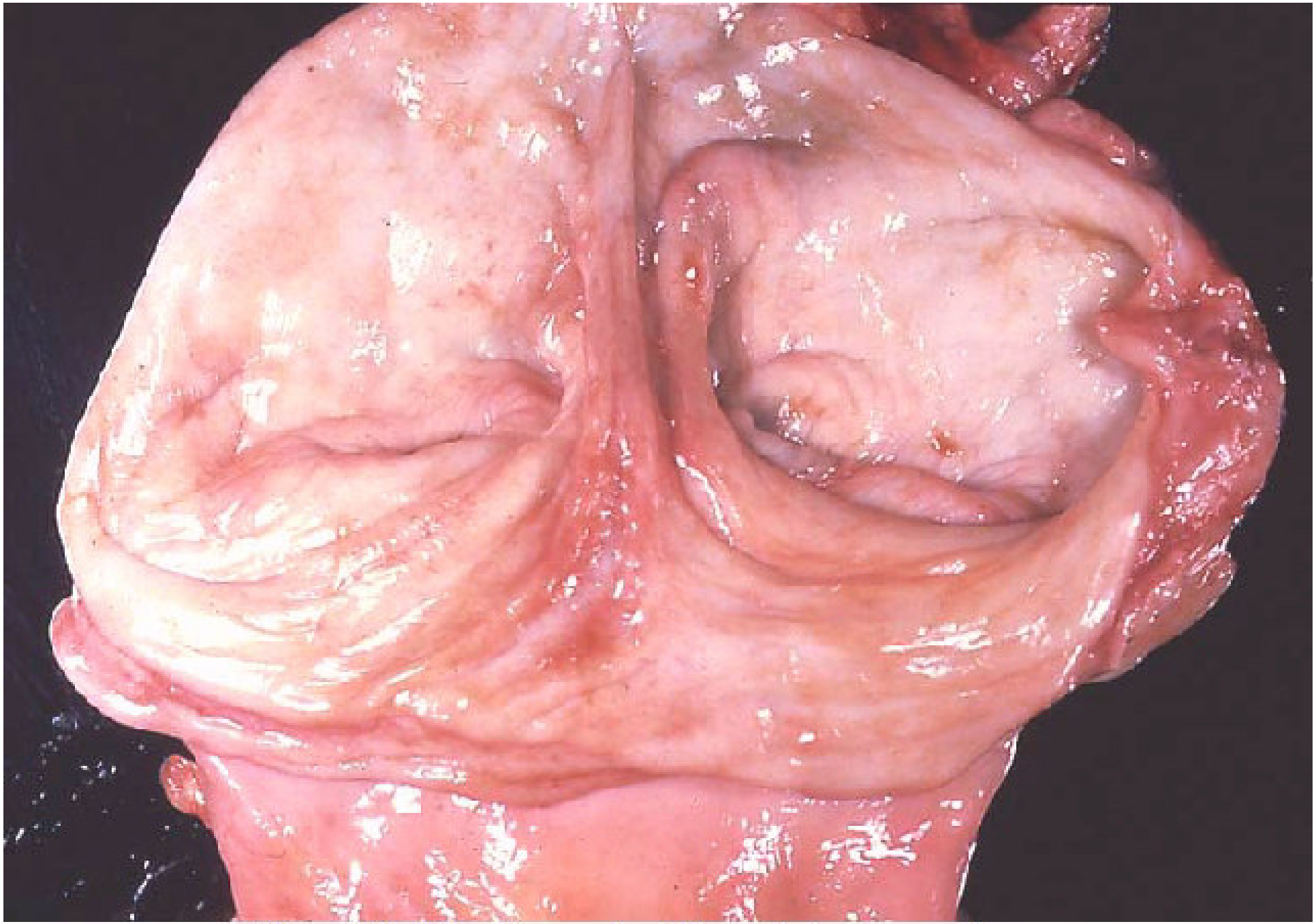
The following lesions occur, either alone or in various combinations:

* Absence of one or both uterine horns, or uterine body (there is no uterine body in buffalo normally).
* Absence of the cervix.
* Completely occluded anterior vagina.
* Thickened imperforated hymen, or a thickened hymen with an extremely small aperture at the site of the normal hymenal vestige just anterior to the external urinary meatus.

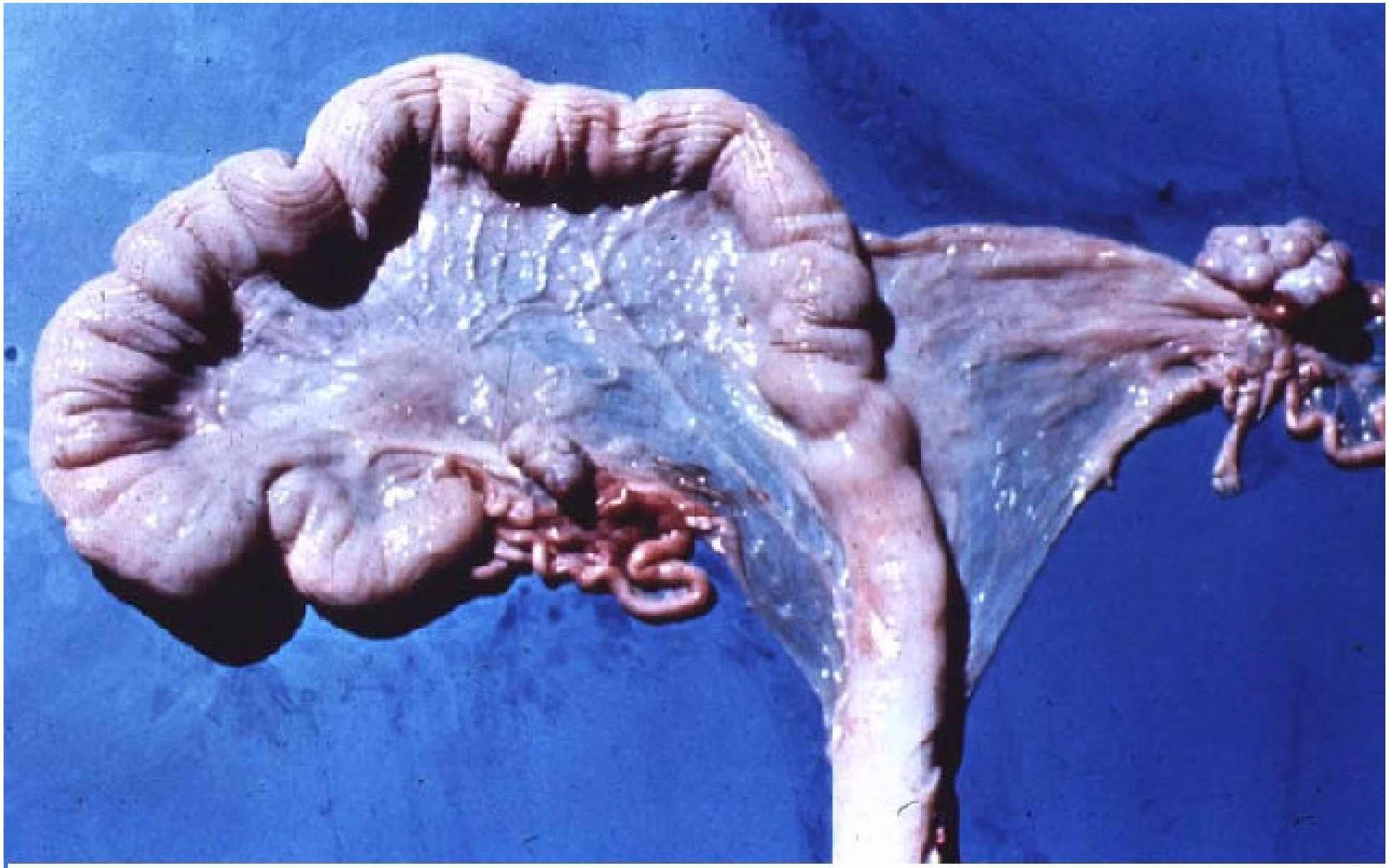
Where portions of the tubular genitalia is absent, the other portions are connected together by fibro-muscular strands.



# Uterus (cow): Didelphys



Genitalia (cow): Double cervix



**Genitalia (pig): Segmental aplasia of the right horn of the uterus**

**oviduct developed normally**

# Uterine Hypoplasia

Retarded development of the genital organs is observed in:

= free-martins

= Uterus Simplex (increased union),

= Uterus Duplex (decreased fusion)

= Cervical atresia toppling of one horn, longitudinal separation by a septum, closure of the cervical canal.

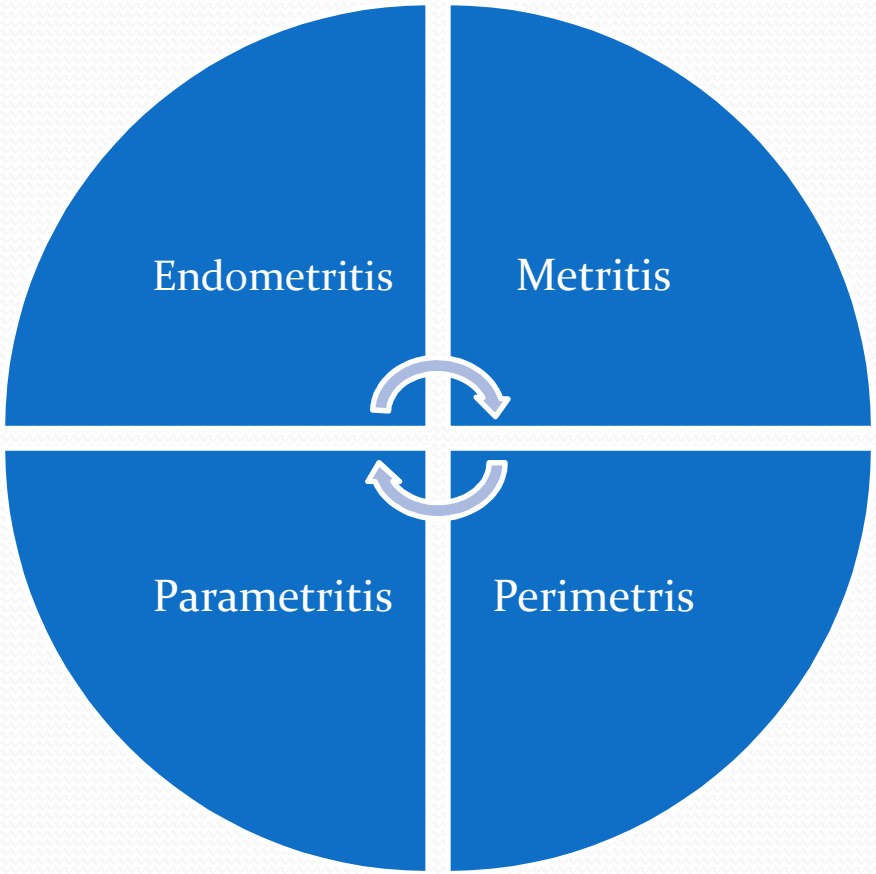
# Vascular changes

- **Hyperemia and hemorrhage associated with estrus**
- **Hemorrhage associated with uterine sub-involution and infection**
- **Vascular lesions associated with pregnancy and puerperium.**

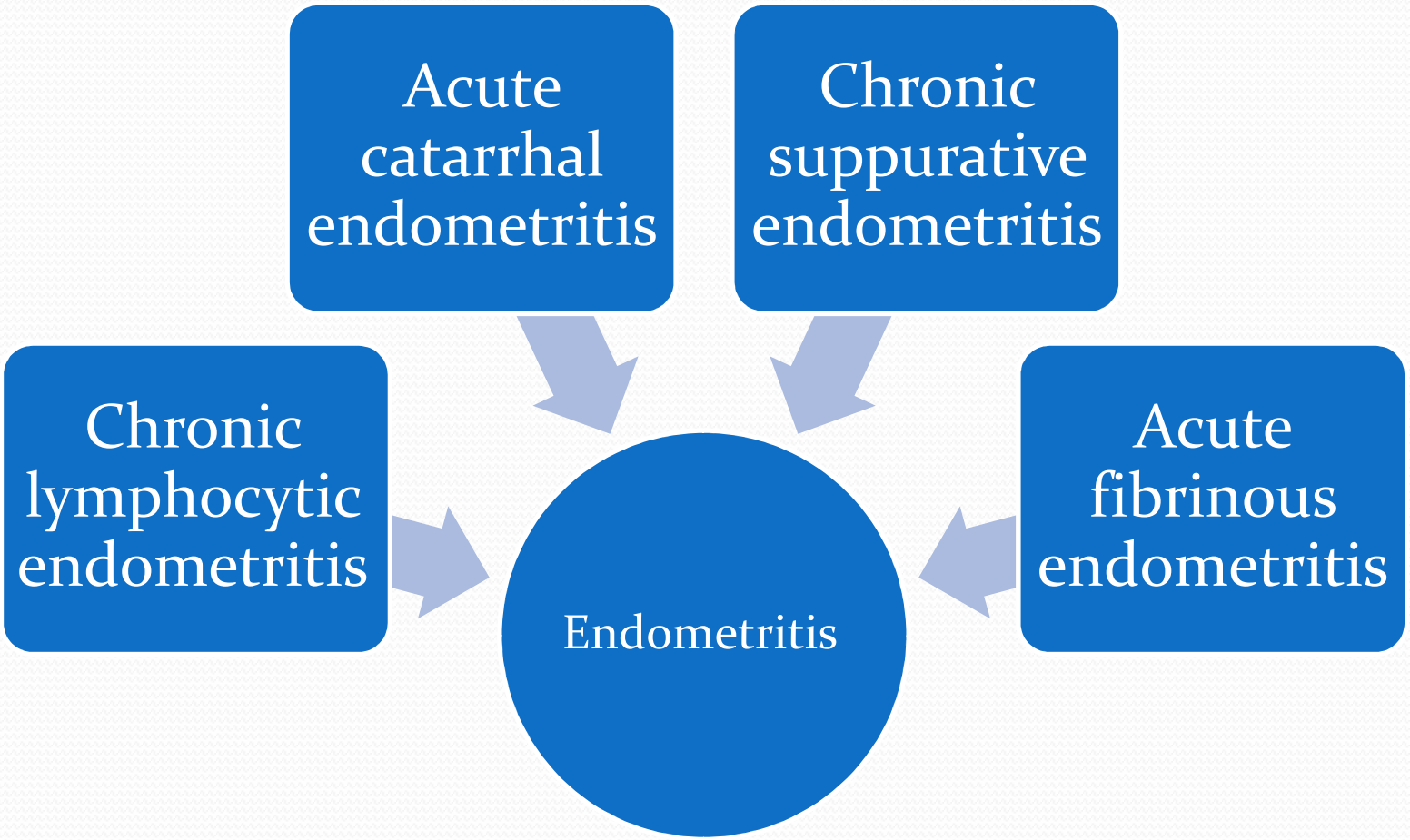
# Degenerative changes

- **Vacuolar degeneration of endometrial mucosa**
- **Endometrial necrosis :**
  - **Caseous**
  - **Coagulative**

# Inflammatory reactions



# Endometritis



# Acute catarrhal endometritis

- **Cause:**
- **Infection with microorganisms of low pathogenicity**
- **Chemical irritants (concentrated antiseptics)**
- **Heat (hot dushing) and Trauma (especially during parturition).**
- **Gross appearance:**
- **Hyperaemea, enlargment, acuumulation of mucous exudate.**
- **Microscopical appearance:**
- **vacuoular degeneration**
- **Accumulation of mucous .**
- **Congestion**
- **Leucocytic infiltrtaion (Neutrophils and lymphocytes)**

# Acute fibrinous endometritis

**Cause: the same causes as previous type but occurs when the aetiologic agent is very severe**

**Gross appearance:**

**Hyperaemea, increased thickness, Presence of fibrin upon the surface of the mucous membrane.**

**Microscopical appearance:**

**The vascular and cellular reaction are very severe - Fibrin strands are present in the stroma of the endometrium and in the lumens of the glands - Cell infiltration, mainly neutrophils, are much more marked.**

# Chronic lymphocytic endometritis

**Causes: Persistence of acute inflammation often results in chronic endometrial involvement**

**Gross appearnce: There is no gross changes.**

**Microscopicl appearance:**

**The changes are non-specific.**

# Chronic lymphocytic endometritis

1- The endometrial epithelial linning may be either intact or denuded in places, or show foci of polyploid hyperplasia (endometritis polyposa) or squamous metaplasa.

2- The endometril glands are few - The glands are atrophic or cystic (cystic endometritis) and surrounded by inflammatory cells (Periglandular cuffing), or surrounded by an increased amount of connective tissue (periglandular fibrosis).

3- Focal or diffuse infiltration of inflammatory cells, mainly lymphocytes, plasma cells, and eosinophils in the endometrial stroma - In mild cases (first degree of endometritis), infiltrating cells are moderate in number and are found mainly in stratum compactum of the endometrium - In moderate cases (second degree of endometritis) there is rather dense infiltration of inflammatory cells in stratum compactum and in the upper part of stratum spongiosum associated with periglandular cuffing and perivascular cell infiltration. in severe cases (third degree of endometritis) infiltration of inflammatory cells in stratum compactum and stratum spongiosum is dense ? Calcified area may be found (endometritis calcificans)

# Chronic suppurative endometritis

**Pyometra** is a suppurative inflammation of the endometrium with accumulation of pus in the uterine lumen due to the presence of closed cervix.

**Cause**:

Infection with pyogenic microoganisms

Closed cervix may be due to:

1- **Mechanical obstruction** such as occurs in cases of fibrosed cervix - This is common in **mares** as a result of prolonged infection with streptococcus genitalium of Klebsielle pneumonia var genitalium - Other causes of mechanical obstruction are related to **anomalies** of reproductive tract, such as aplasia.

2- **Functional obstruction** which occurs in cases of persistent corpus luteum.

3- **Foetal death** when it is due to infection with pyogenic bacteria.

# Chronic suppurative endometritis

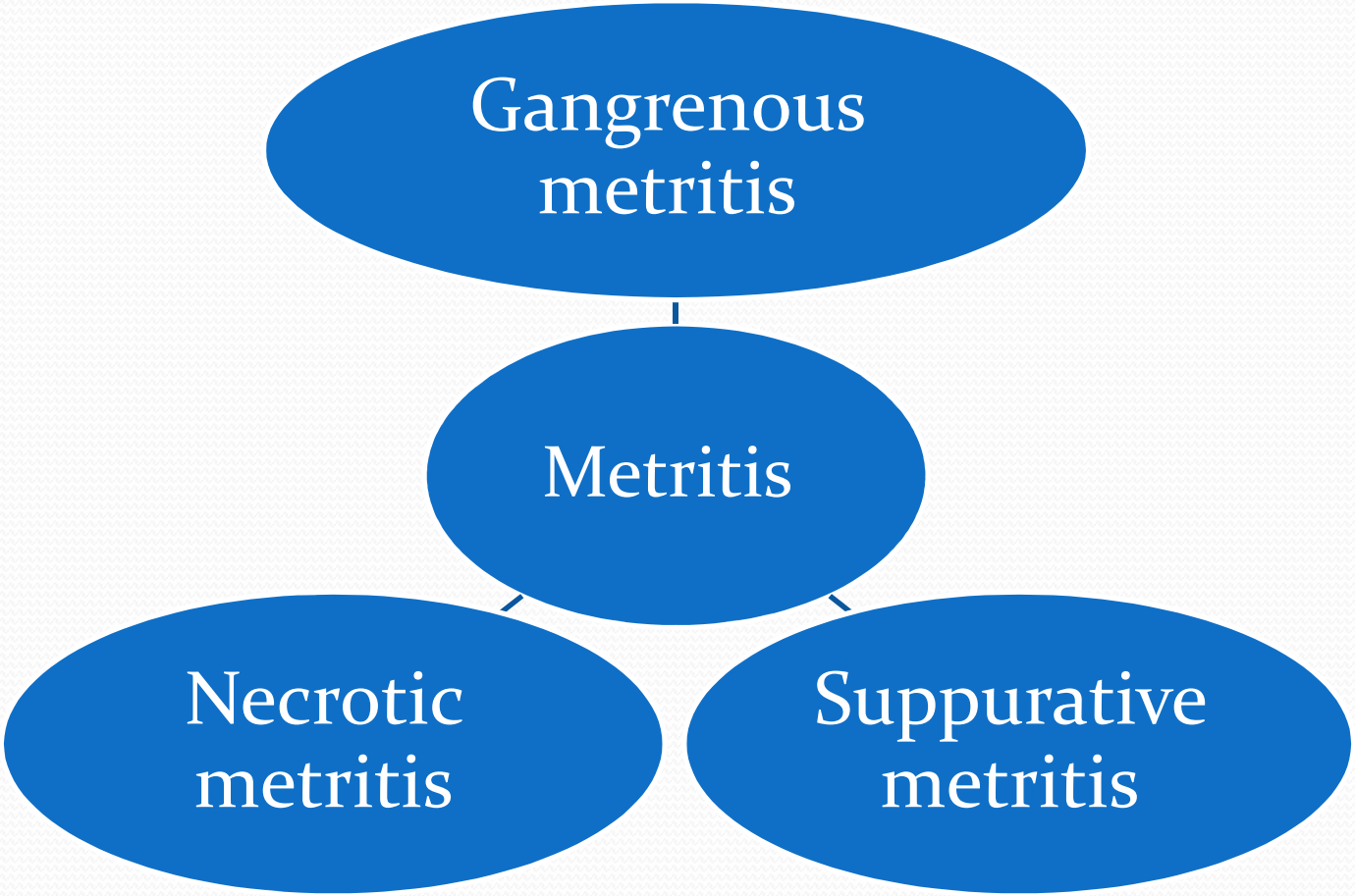
- **Gross appearance:**

- **Accumulation of thick, creamy pus within uterine tissue and uterine lumen (may reach several liters). The wall of the uterus is thick, doughy and paretic, but in long-standing cases the wall is thin or fibrosed - Pyosalpinx or peritonitis may exist - discharging of pus from vagina if the cervix is opened.**

- **Microscopical appearance:**

- **Proliferation and hyperplasia of the epithelial cells of the endometrium - The cells are enlarged, columnar, vacuolated and have a small pyknotic nuclei - In some cases, the normal single layer of cells piles up to produce pseudostratification or localized papillary proliferation as a protective phenomenon - Masses of neutrophils collect in the uterine lumen and in the glands - The infiltrating neutrophils are dense in the endometrial stroma, associated with some lymphocytes and plasma cells - Although there is relative sparing of the glands, some may undergo cystic degeneration.**

# Metritis


Gangrenous metritis
Metritis
Necrotic metritis
Suppurative metritis

# Septic Metritis

**Causee: Pyogenic bacteria.**

- **Gross appearance:**
- **The wall of the uterus is thickened, reddened and oedematous and is very friable - The serosa is dull and finely granular with hemorrhages and a thin fibrin deposits - The secretions may be scant or abundant, and is dirty yellow to reddish-black in colour.**
- **Microscopical appearance:**
- **The linning epithelium is desquamated, and the glands may contain mucous - Intensive infiltration of inflammatory cells, mainly neutrophils, in the mucosa and deep in the muscle layer of the myometrium - The muscle fibers undergo granular degeneration - Leucocytic invasion of the wall of blood vessels (arteries and veins) in the mucosa and deep layers of the uterine wall leading to periangitis, angitis, and endangitis - Thrombus formation of the necrotic veins, which may extend to the vessels of the perimetrium - The subserosal connective tissue are oedematous and infiltrated with neutrophils.**
- **Effect:**
- **In cases of recovery, chronic suppurative endometritis commonly persists for sometimes, otherwise, general septicaemia and pyaemia with fatal results may occur.**

# Necrotic Endometritis

Cause: Fusiformis necrophorus- Necrobacillosis.

Gross appearance:

The uterus is enlarged and the wall is thick and rigid - scanty inflammatory exudate in the lumen .The mucosa is thickened and folded, patchy necrotic, friable and ulcerated with a dark ragged surface - On section, the mucosal thickening is of a yellowish necrotic layer of tissue and this is separated by a zone of hyperaemia from an outer layer of firm grey granulation tissue which replaces the myometrium.

Microscopical appearance:

Extensive coagulative necrosis of the mucosa and deeper to the myometrium . The affected area is structureless and demarcated with masses of leucocytes surrounded by a hyperaemic granulation tissue . Extensive vasculitis with thrombosis is characteristic.

# Gangrenous Metritis

- Gangrenous metritis occurs following invasion of saprophytic and putrefactive bacteria to necrotic uterus - The condition commonly occurs following parturition.

Gross appearance:

The uterus is distended with a reddish-brown or greenish-brown mixture of partially clotted blood, foetal membranes, and exudate which has a very offensive gangrenous odour. The uterine wall has a diffuse red staining - The endometrial surface has may contain ulcers, and frequently is covered with shreds of fibrin. The serosal surface is hyperaemic, contains petechial haemorrhages and is often partially covered with a layer of fibrin. Sometimes, there is fibrinous adhesion between the uterus and the serosal surface of other organs or the peritoneum. The arteries and veins, of the broad ligament are frequently thrombosed.

Microscopical appearance:

- Coagulative necrosis , the architecture of the uterus is present and the cellular details are maintained –
- Oedema and haemorrhage are present in the uterine wall
- Focal and diffuse infiltration of leucocytes, mainly neutrophils
- The bood vessels are thrombosed.

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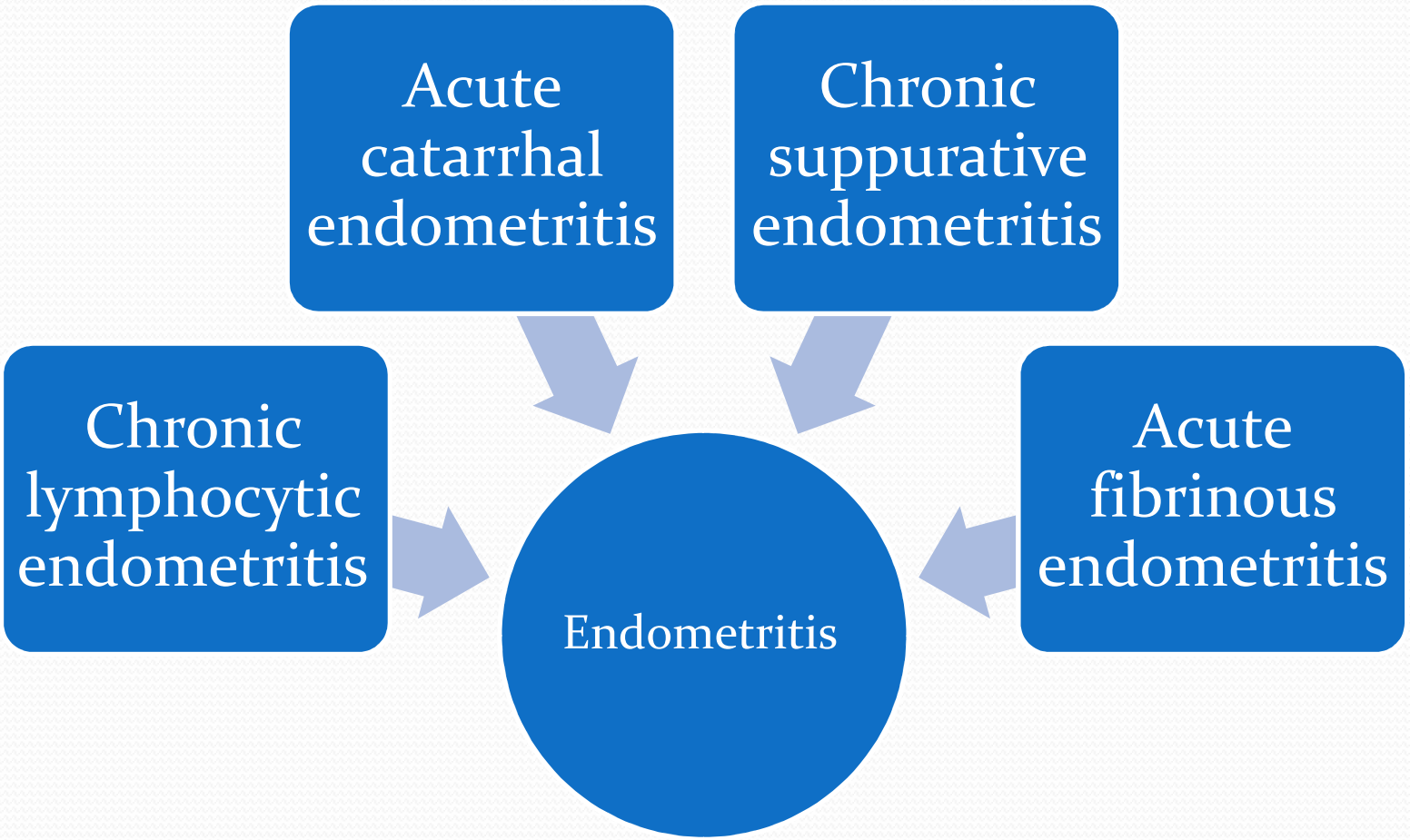
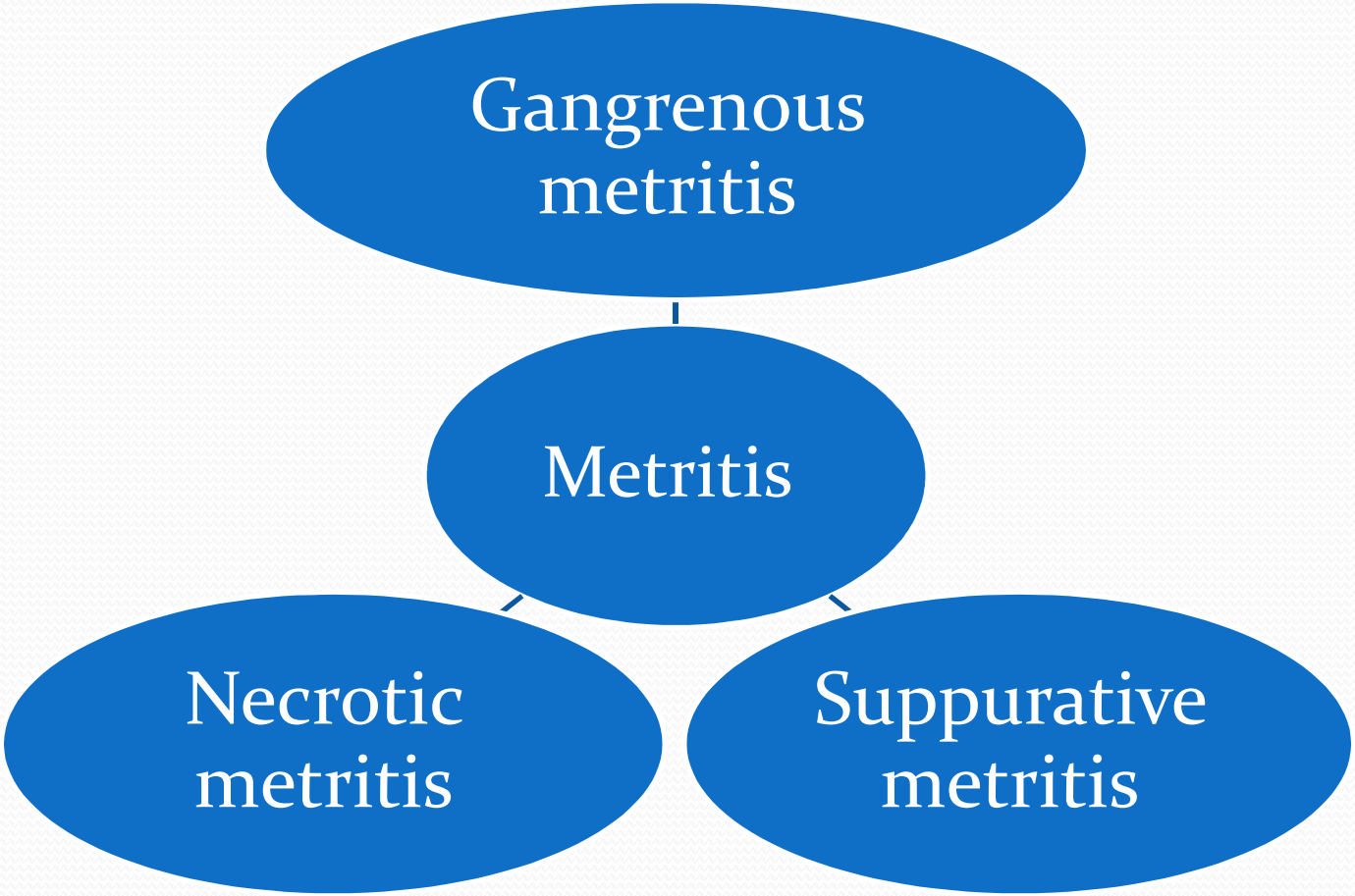
# Endometritis



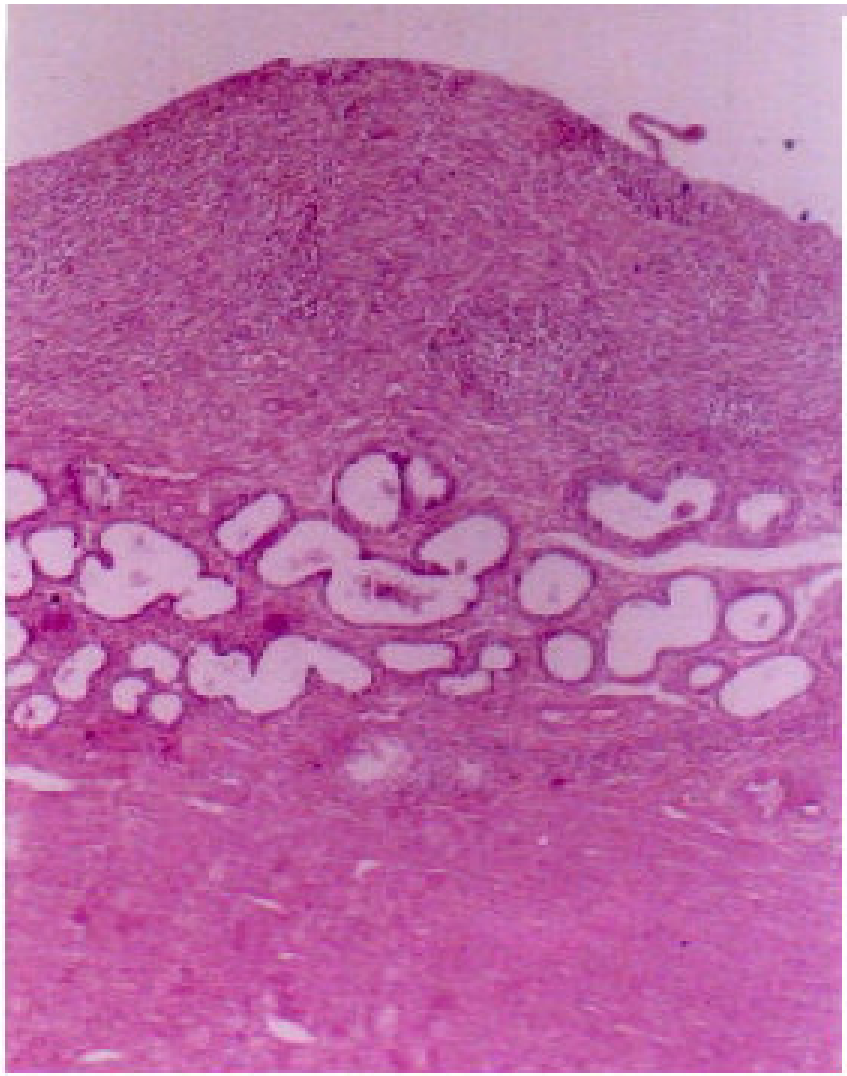
# Metritis


Gangrenous metritis
Metritis
Necrotic metritis
Suppurative metritis

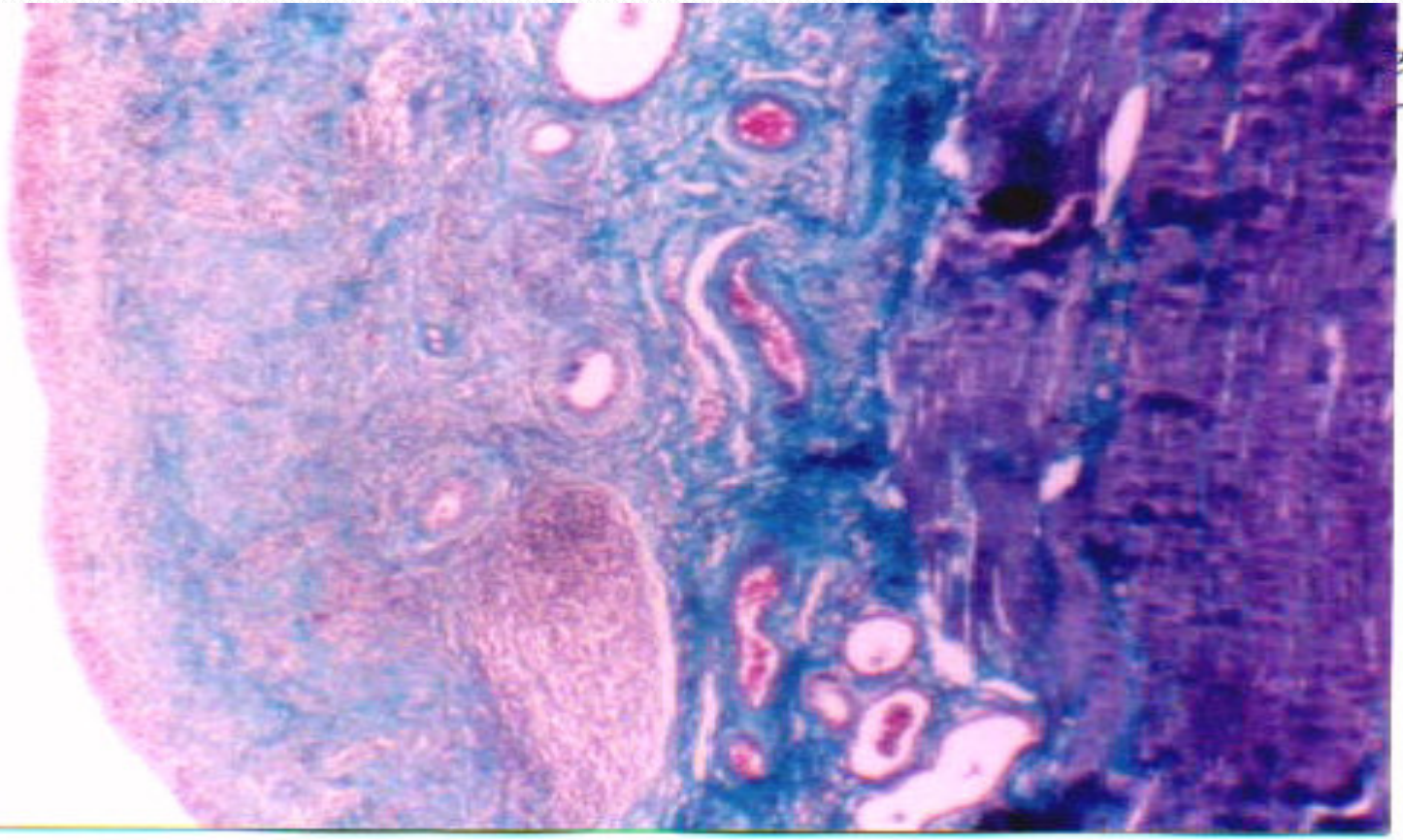

Pyometra in dog

# Pyometra (dog)

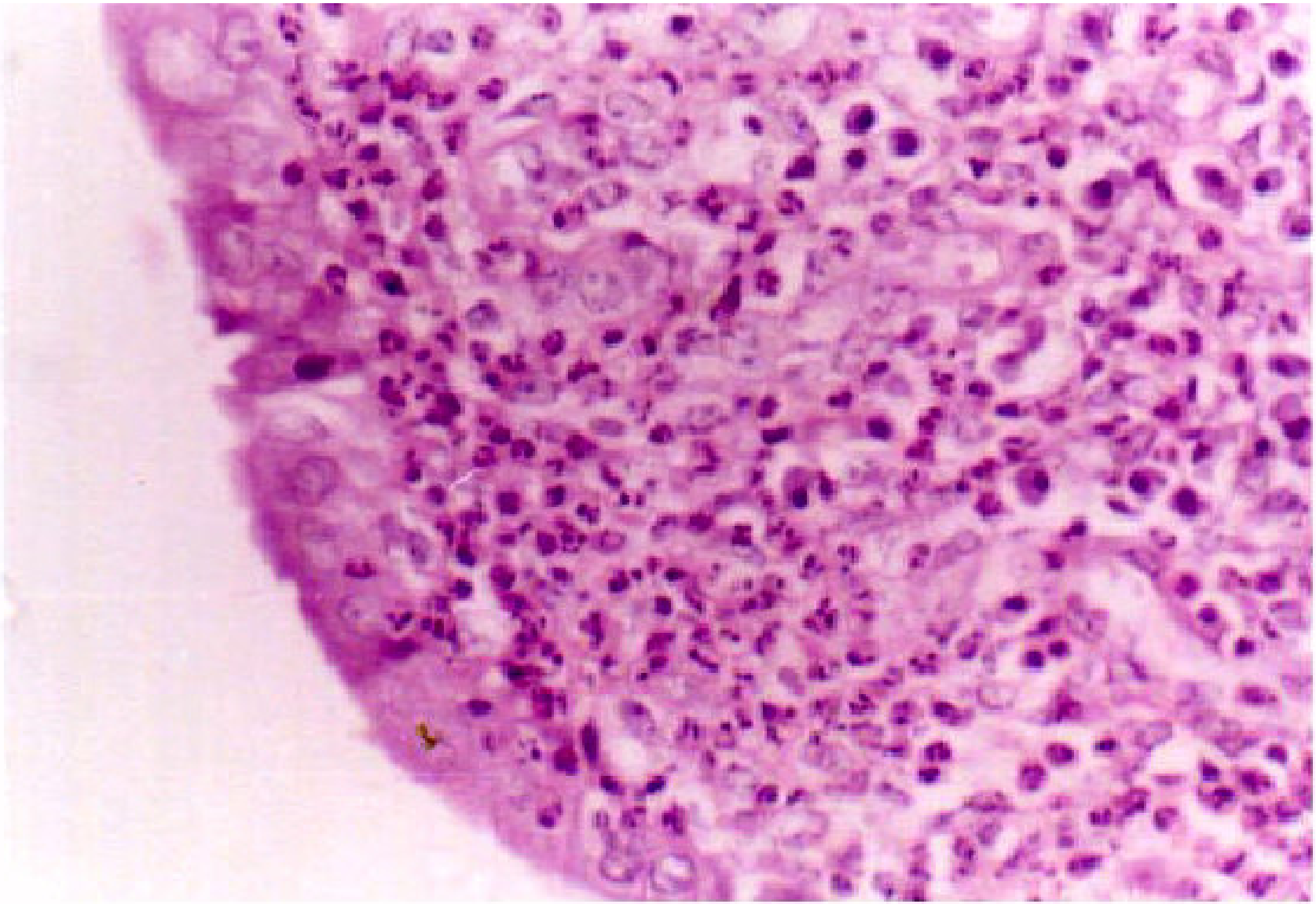

Pyometra (dog)



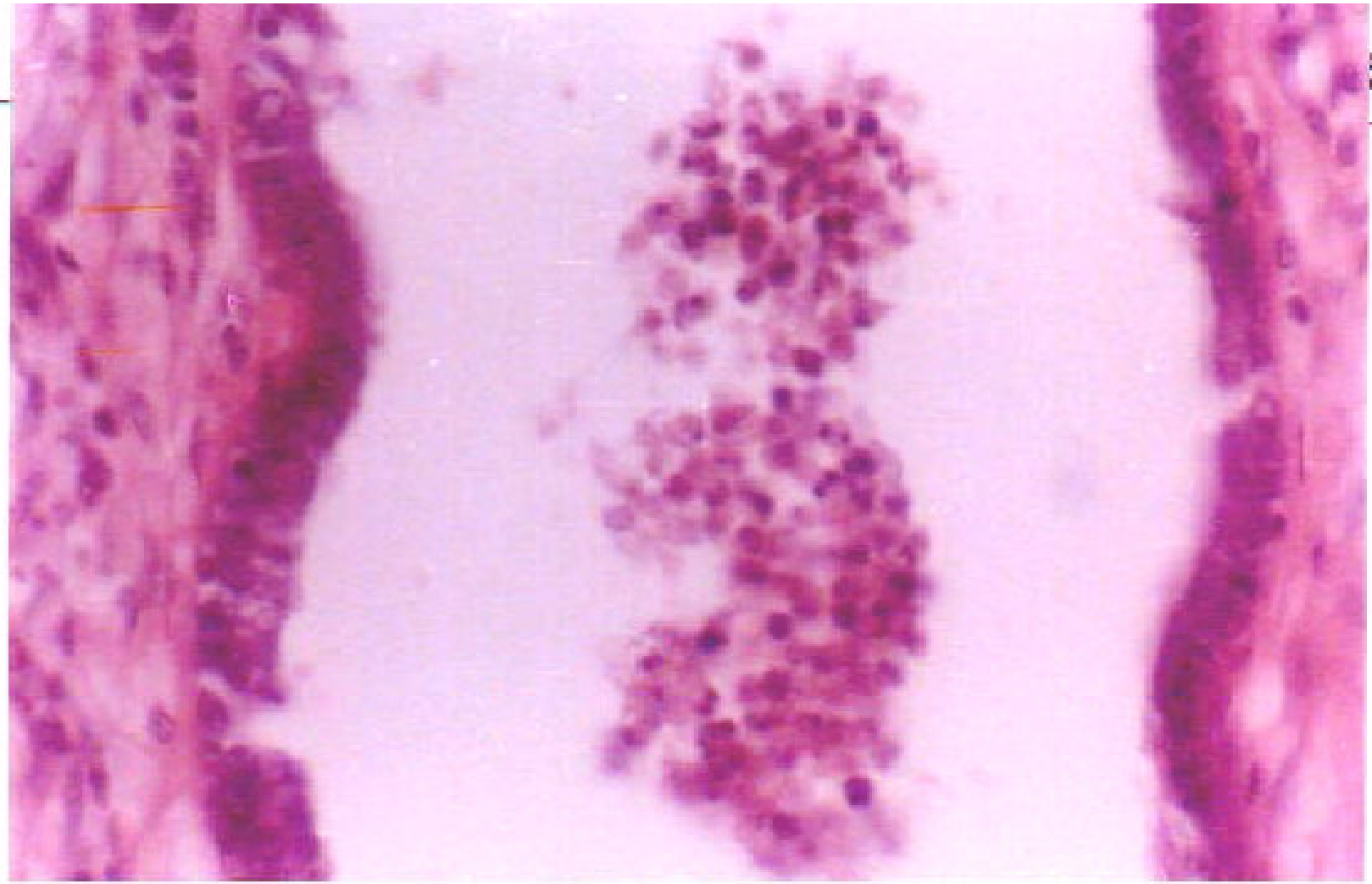
Uterus of non-pregnant cow showing case of pyometra characterized by dilatation of uterine glands and thinning of the endometrium (H&E – X40)



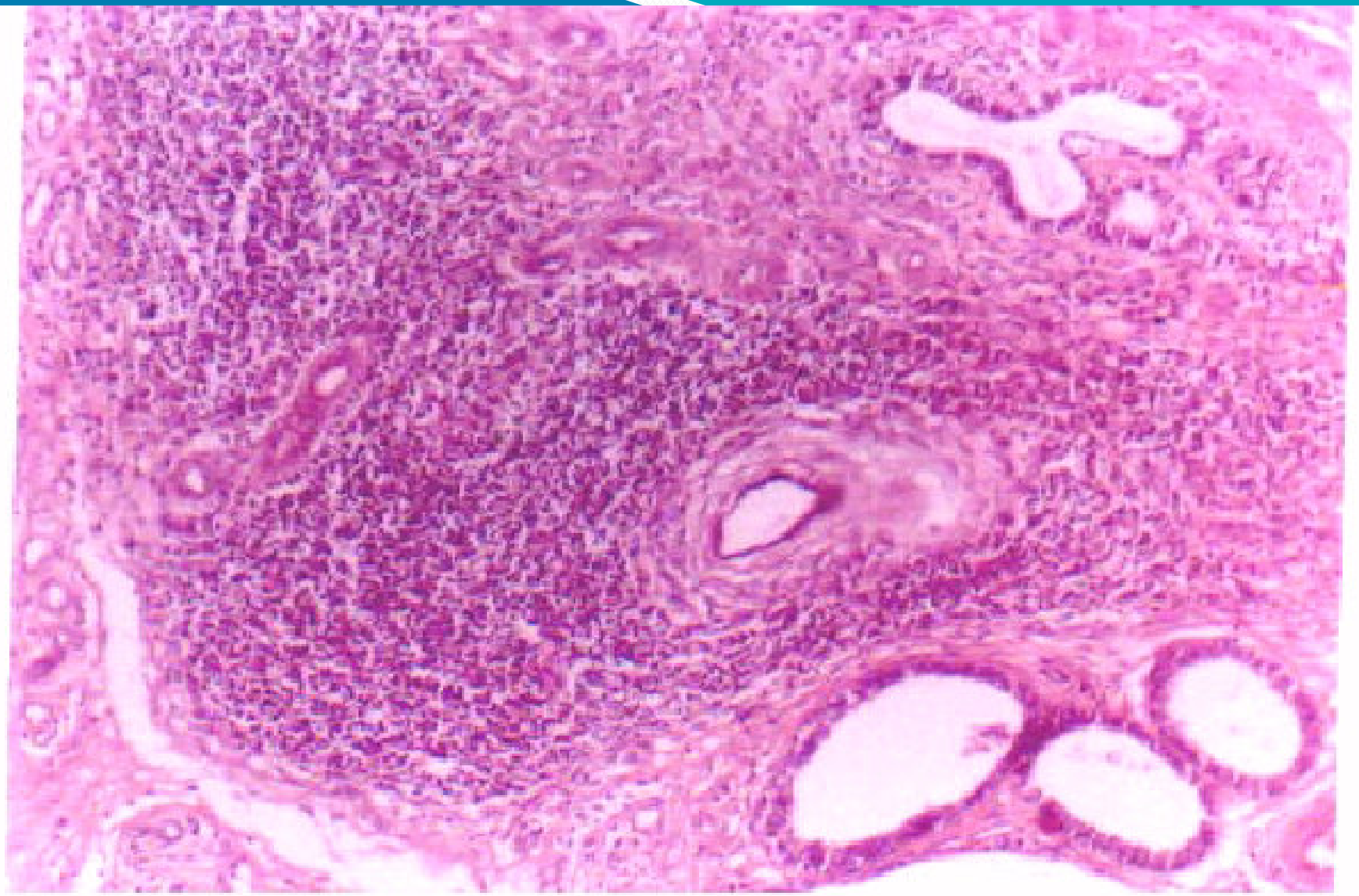
Uterus of non-pregnant cow showing focal leucocytyic infiltration, increased stromal matrix, cyctic glandular hyperplasia and congestion of blood vessels (Masson trichrome stain – X40)



**Uterus of non-pregnant cow showing massive neutrophilic and plasma cell infiltration (H&E – X400)**



Uterus of non-pregnant cow showing accumulation of the neutrophils in the lumen of endometrial gland (H&E – X400)



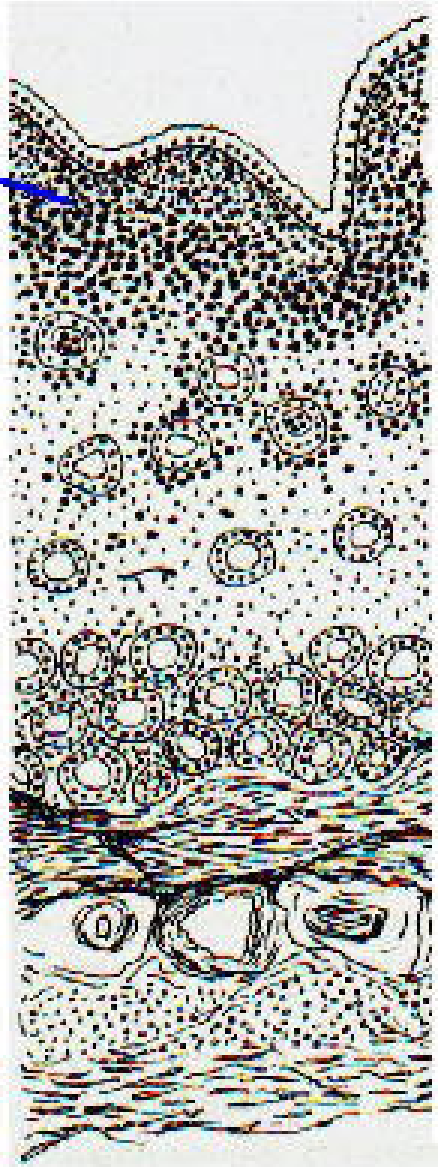
Uterus of non-pregnant cow showing perivascular cuffing (H&E – X100)

Lymphocytes and plasma cells

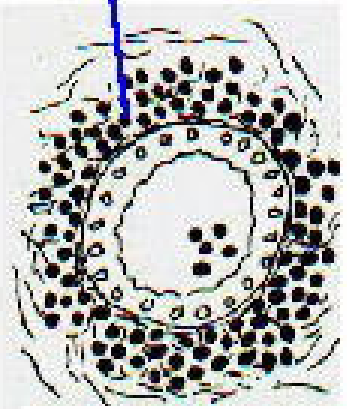
Endometrium

Myometrium

Perimetrium

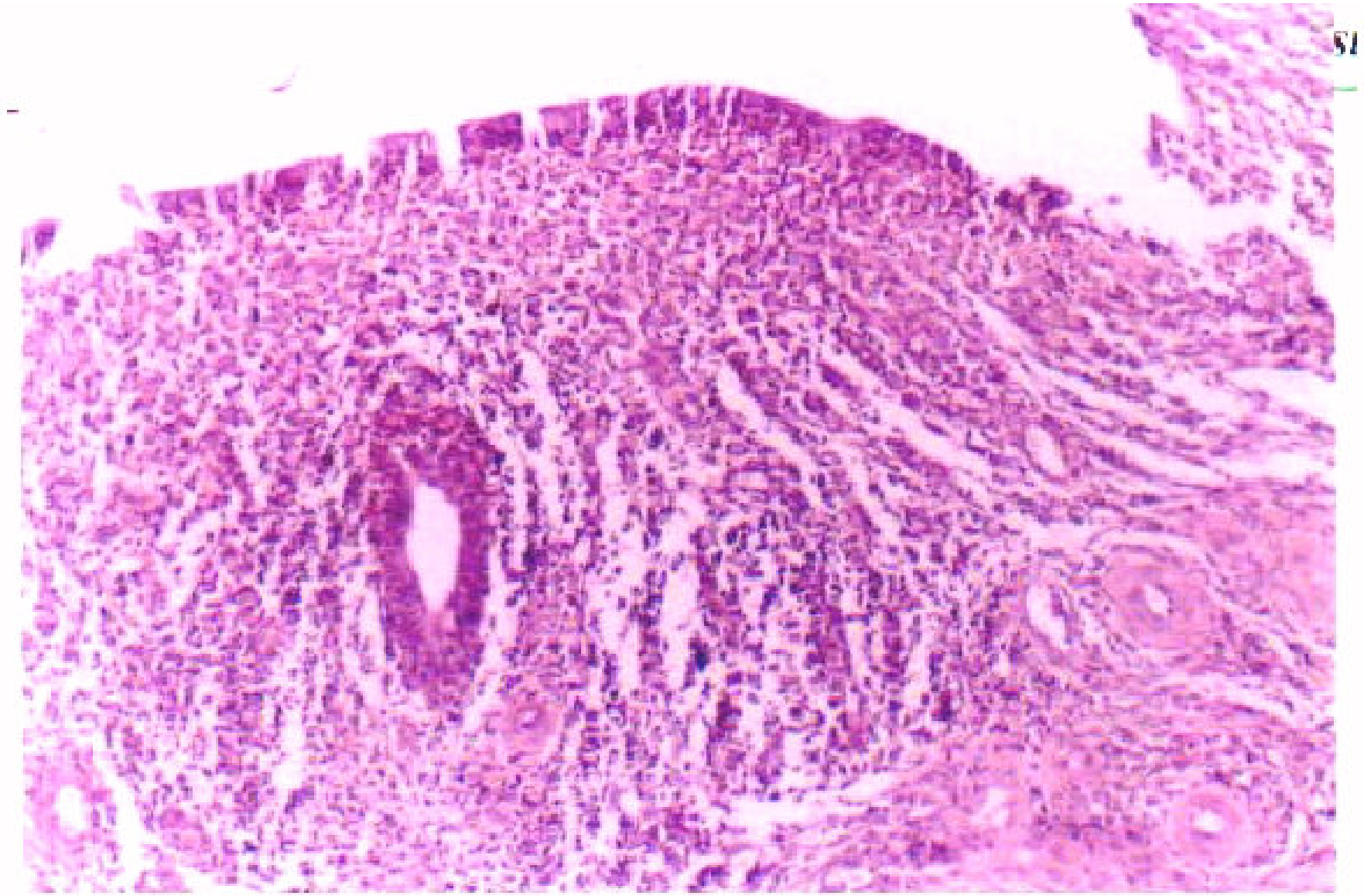


lymphocytes and plasma cells

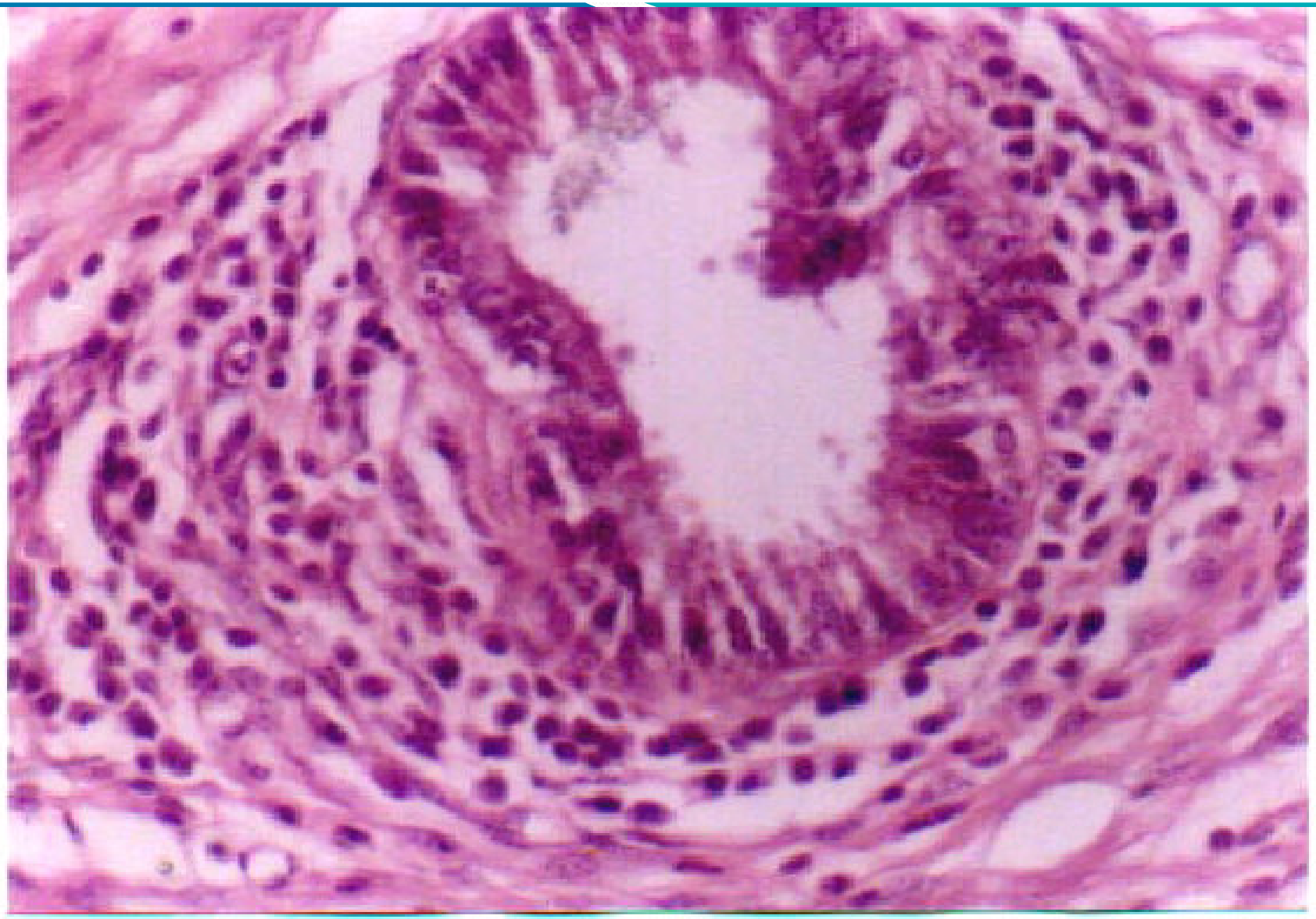


Periglandular cuffing

# Lymphocytic (non-suppurative) endometritis

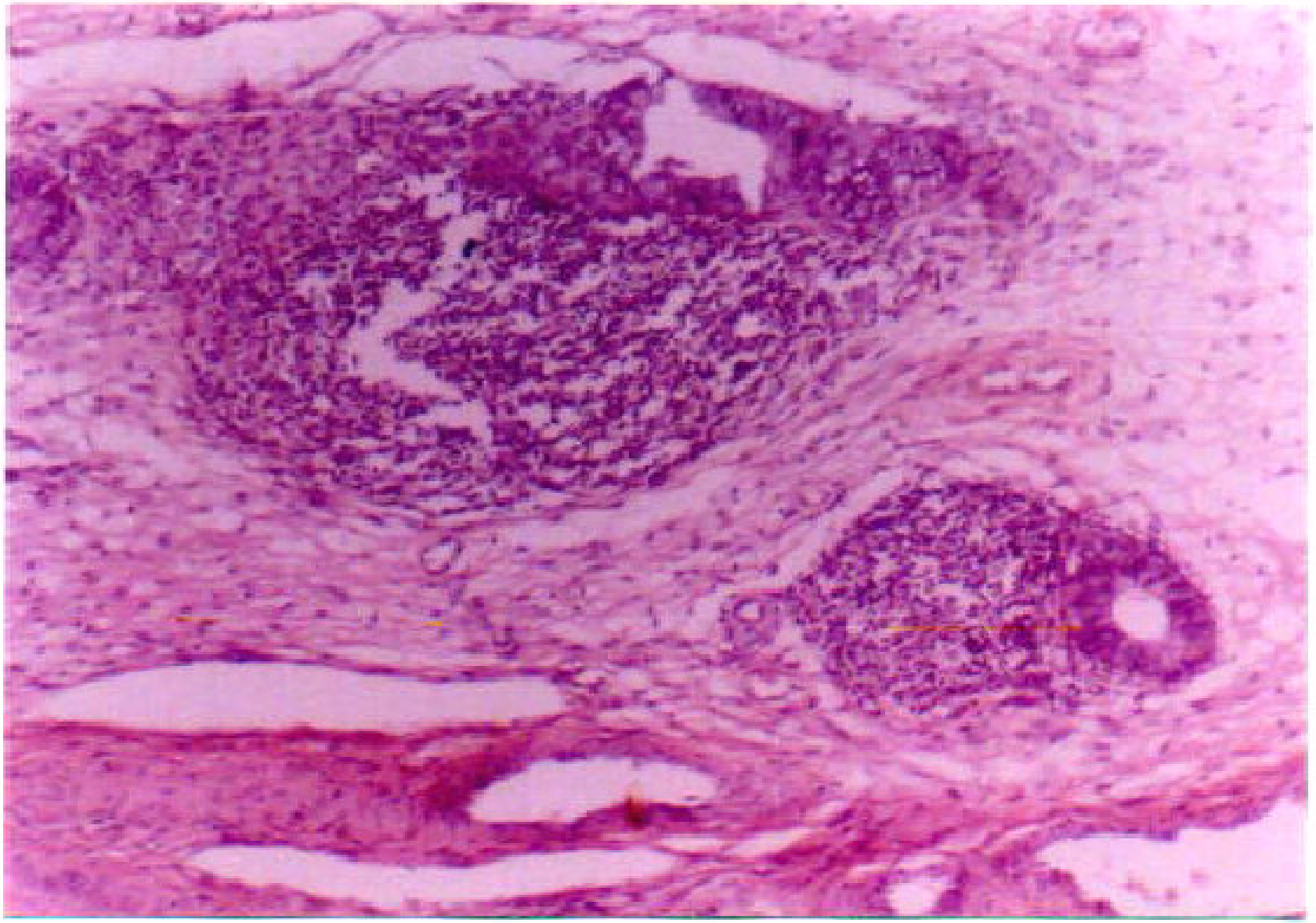


Uterus of non-pregnant cow showing mononuclear cell infiltration (H&E – X100)

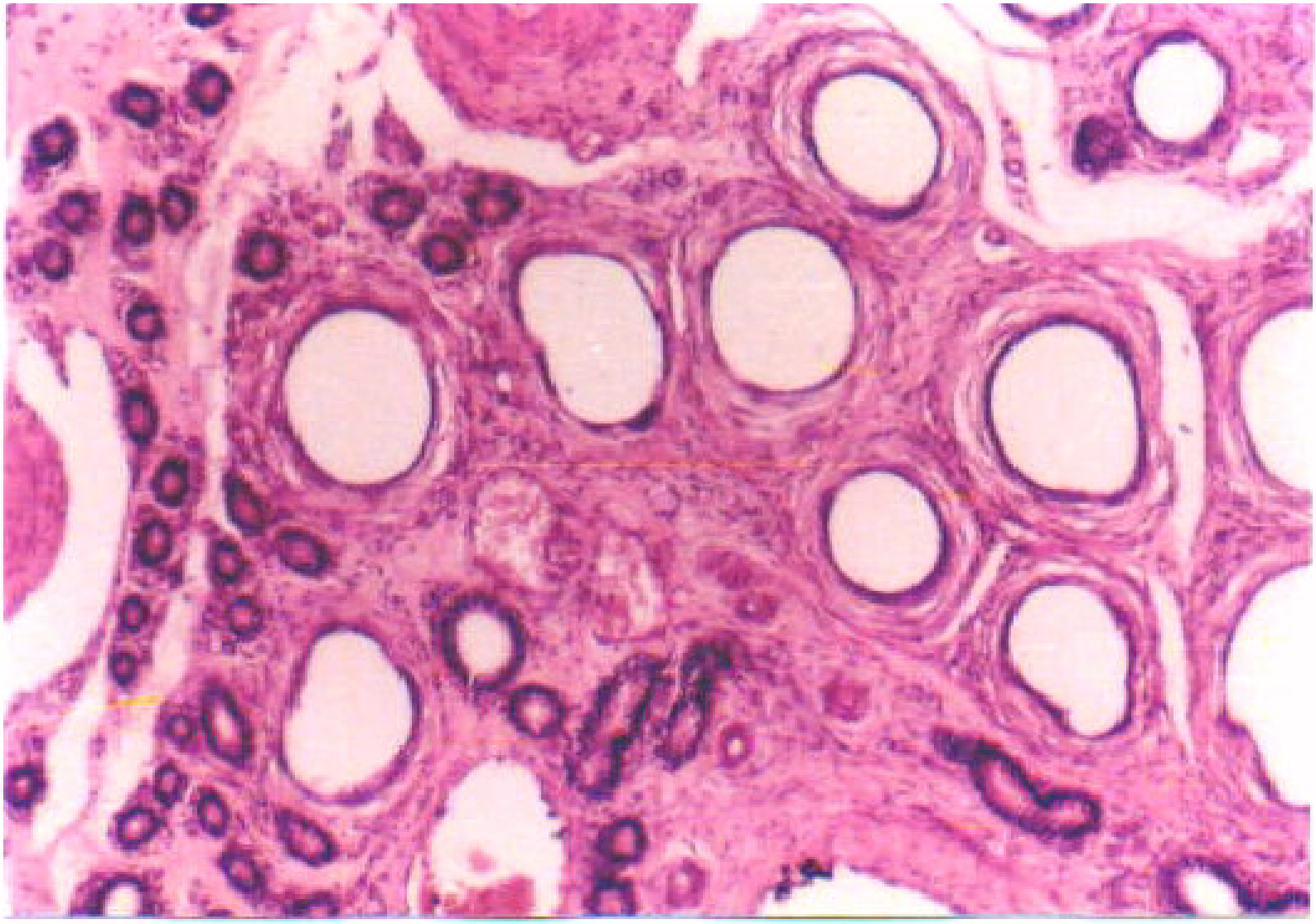


Uterus of non-pregnant cow showing periglandular cuffing

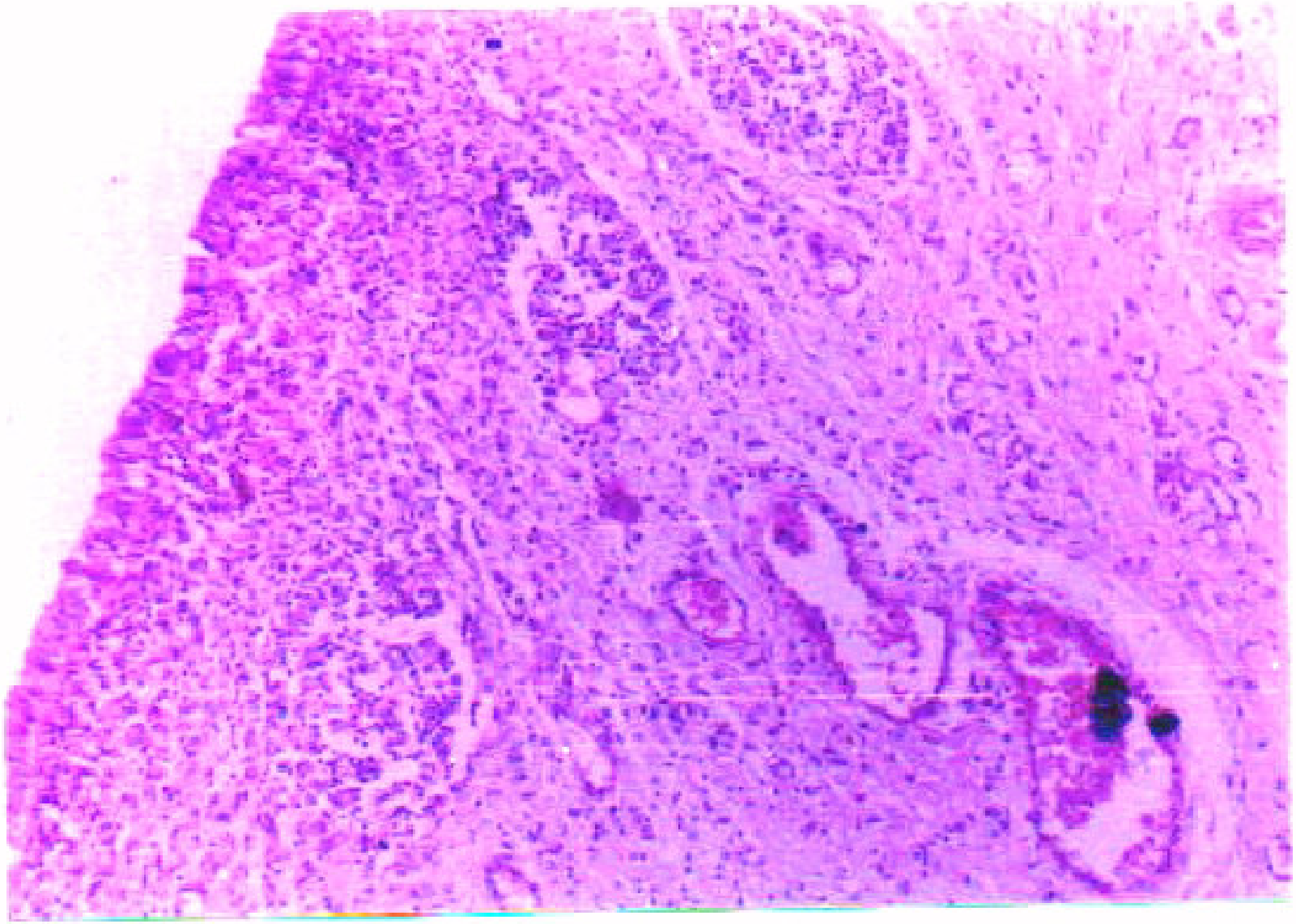
(H&E – X400)



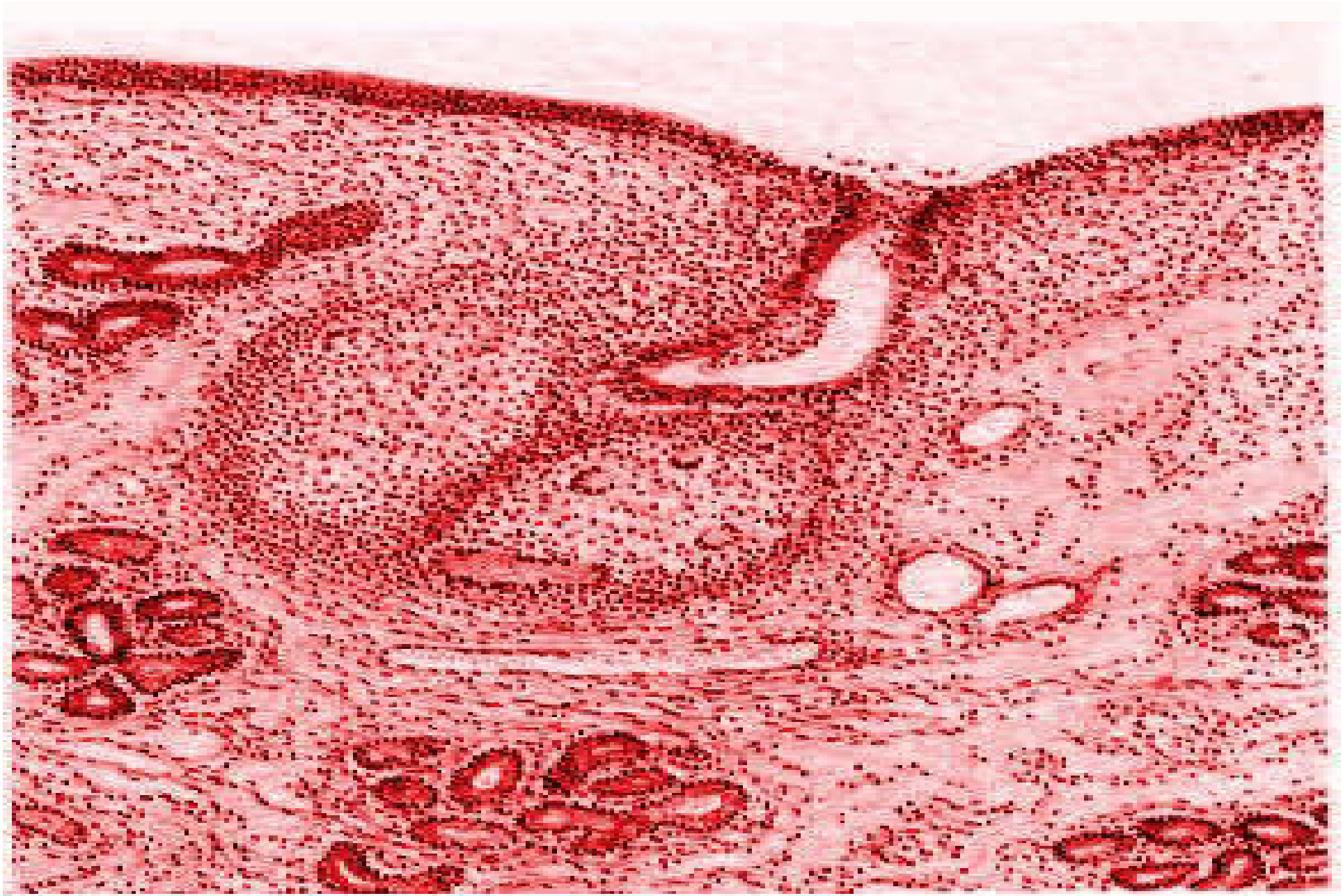
**Uterus of non-pregnant cow showing periglandular mononuclear cell infiltration (H&E – X100)**



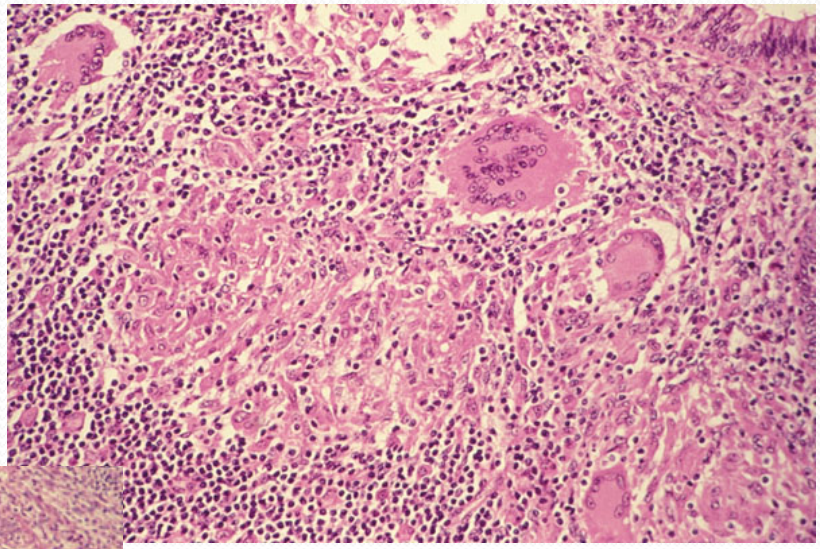
: Uterus of non-pregnant cow showing active proliferation of stromal connective tissue around dilated glands (H&E – X100)

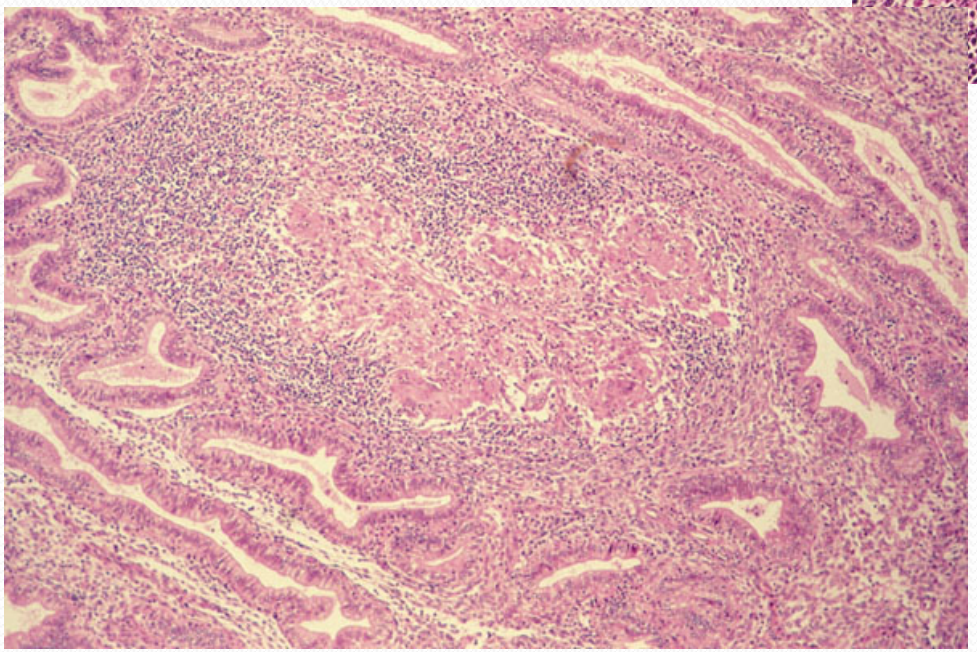


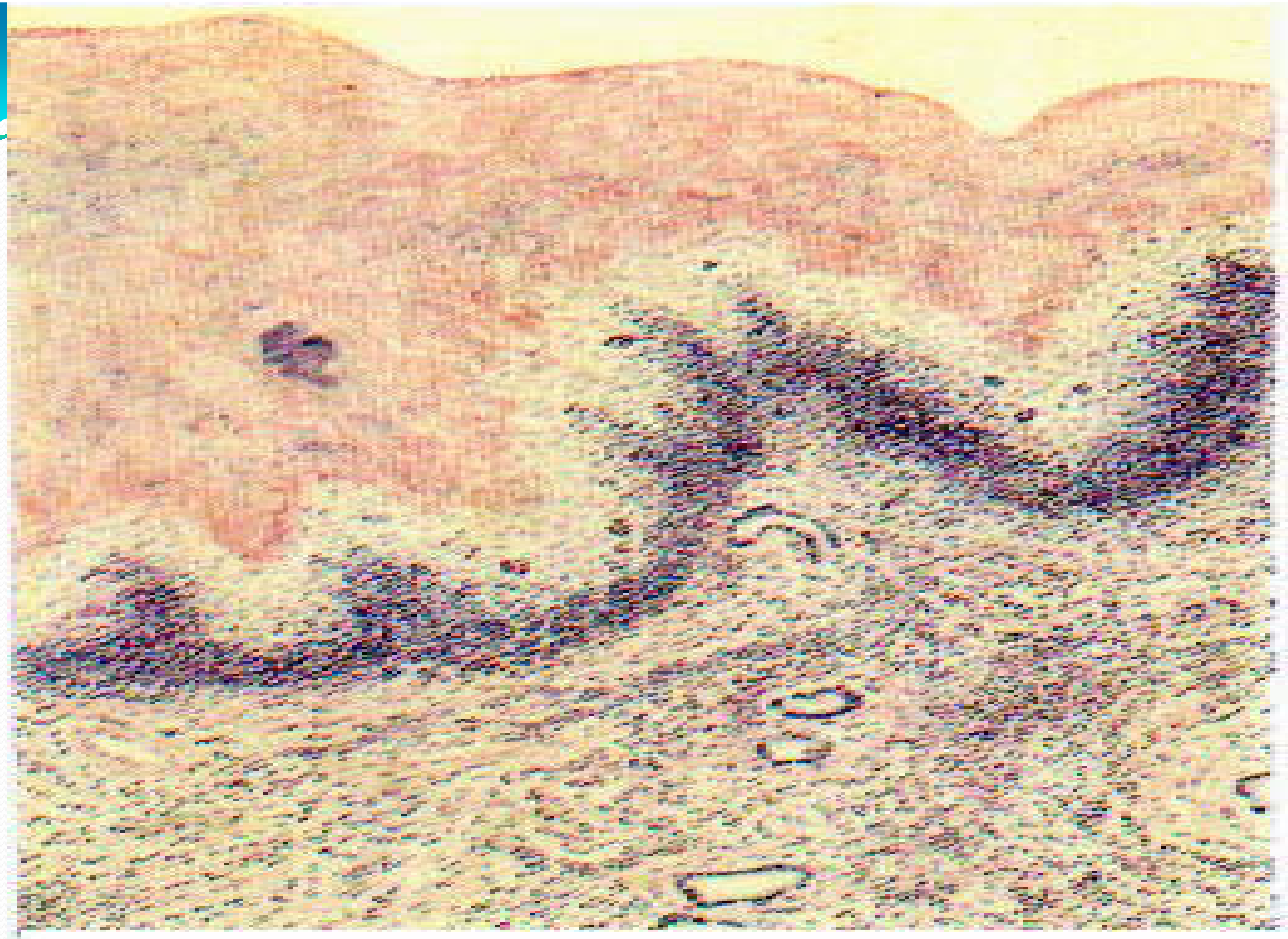
Uterus of non-pregnant cow showing multifocal leucocytic infiltration (H&E –X100)



Tuberculous endometritis in cattle







Uterus

caseous endometritis

# Acquired changes in position

- **Uterine torsion**
- **Uterine prolapse**
- **Hernation**

# Dist in growth & tumors

- **Hyperplasia**
- **Atrophy**
- **Metaplasia**
- **Neoplasia**

# Uterine Atrophy

**Cause:**

**1) Senility (2) Hypopituitarism resulting from wasting diseases, starvation, or lesions in the pituitary.**

**Gross appearance:**

**The endometrium is flat ,thin and greyish . in cattle, there is no obvious carcuncles.**

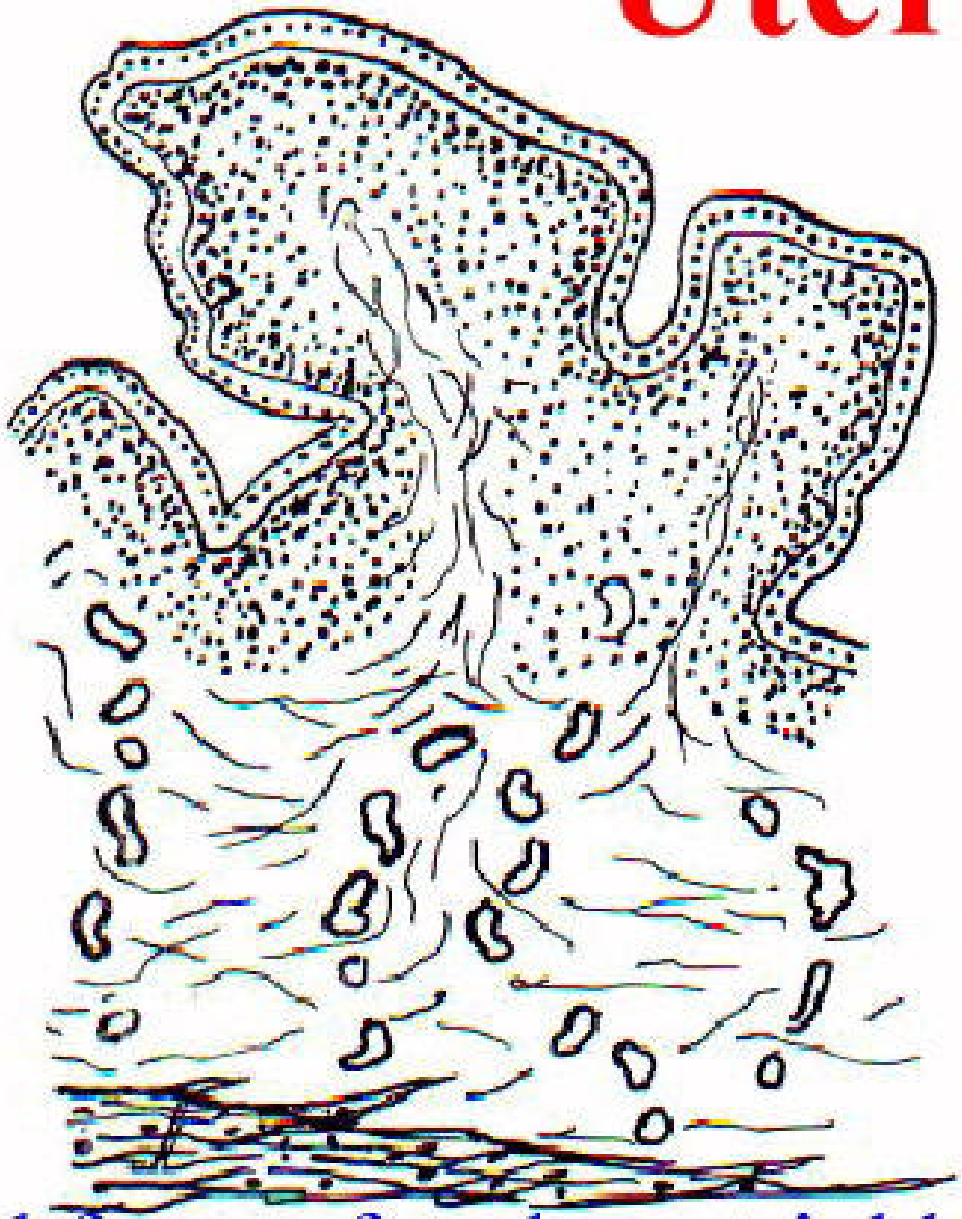
**Micrscopical appearance:**

**The more superficial portions of the endometrium are the more atrophic ones - In advanced atrophy, the linning mucosa are covered by a single layer of condensed stroma in the depth of which are the inactive glandular remnants which are sometimes cystic.**

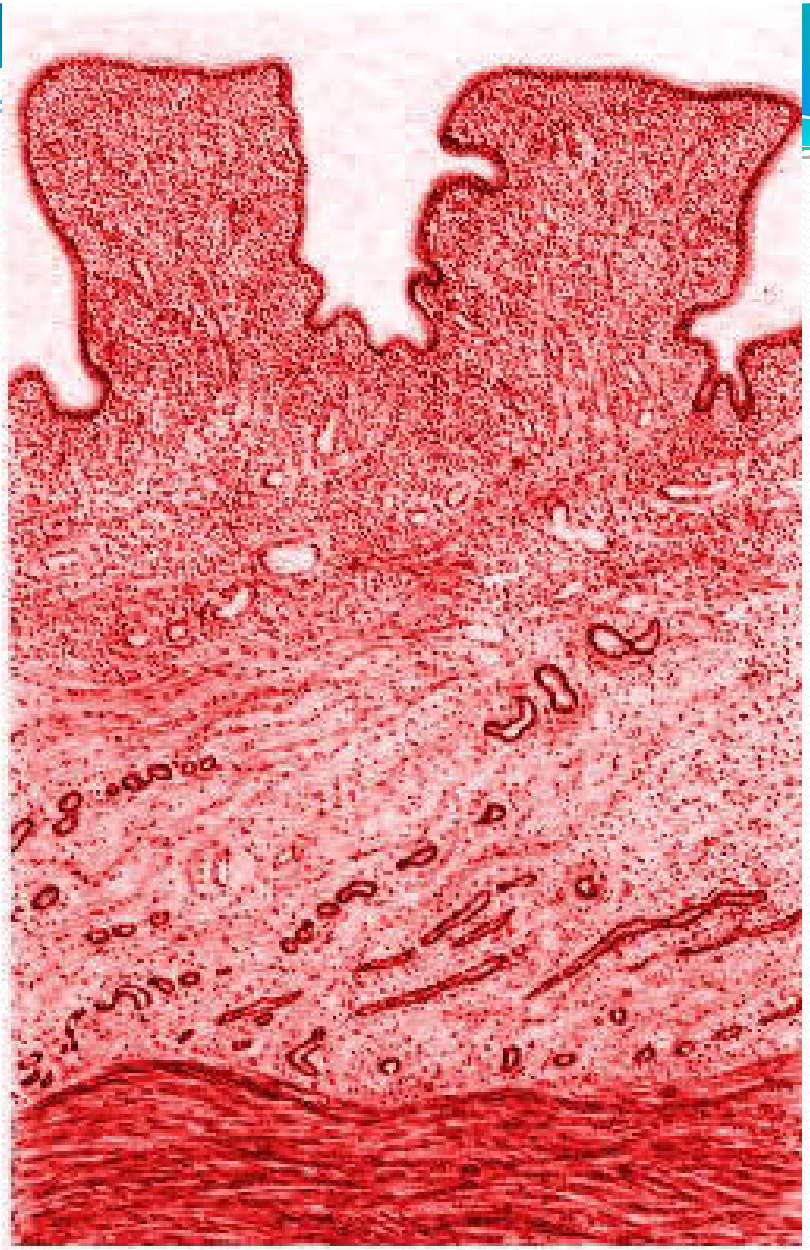
# Lesions based on increased estrogen

- **Adenomyosis**
- **Polyp**
- **Mucometra**
- **Hydrometra**
- **Cystic Glandular Hyperplasia of the Endometrium**

# Uterus



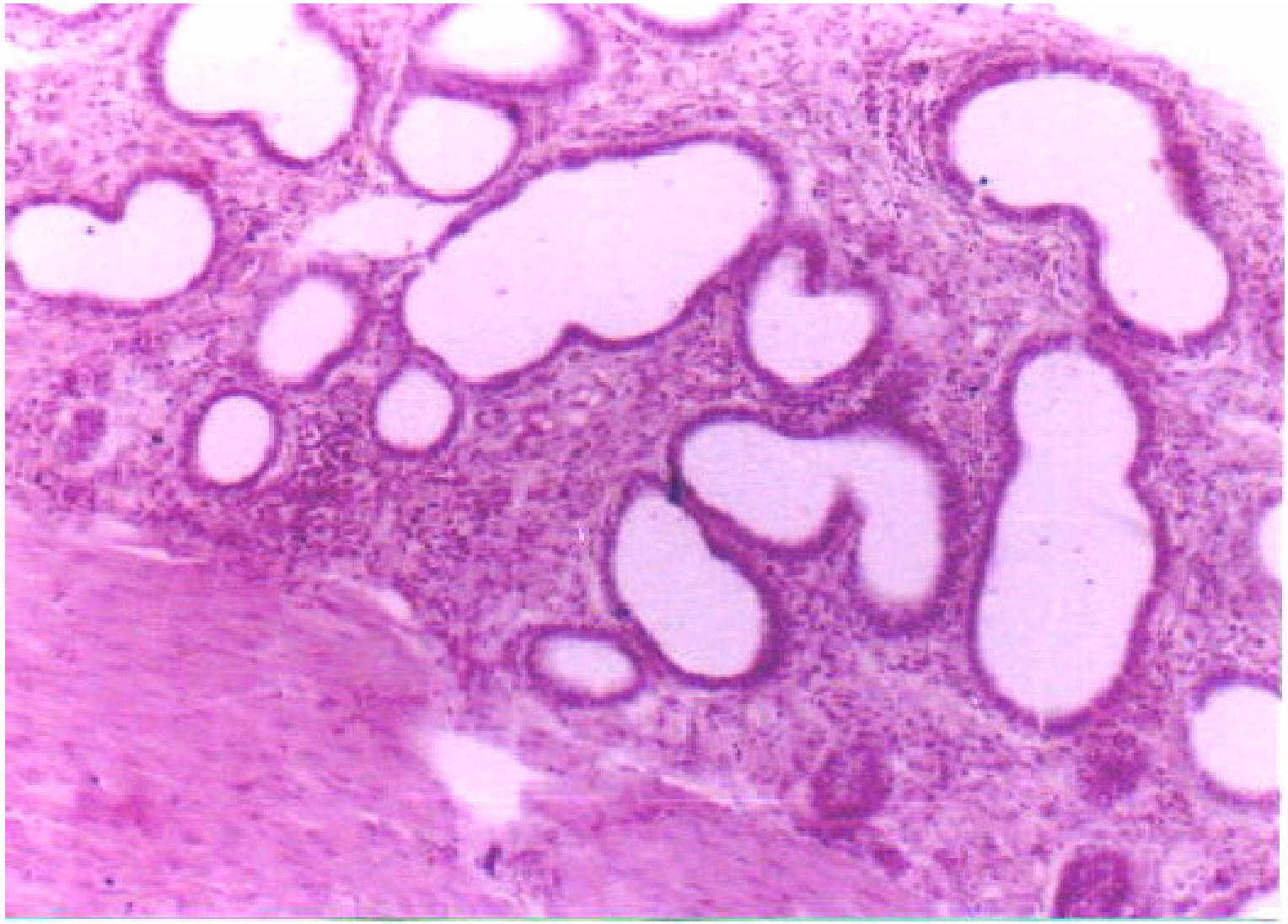
Polyploid form of endometrial hyperplasia



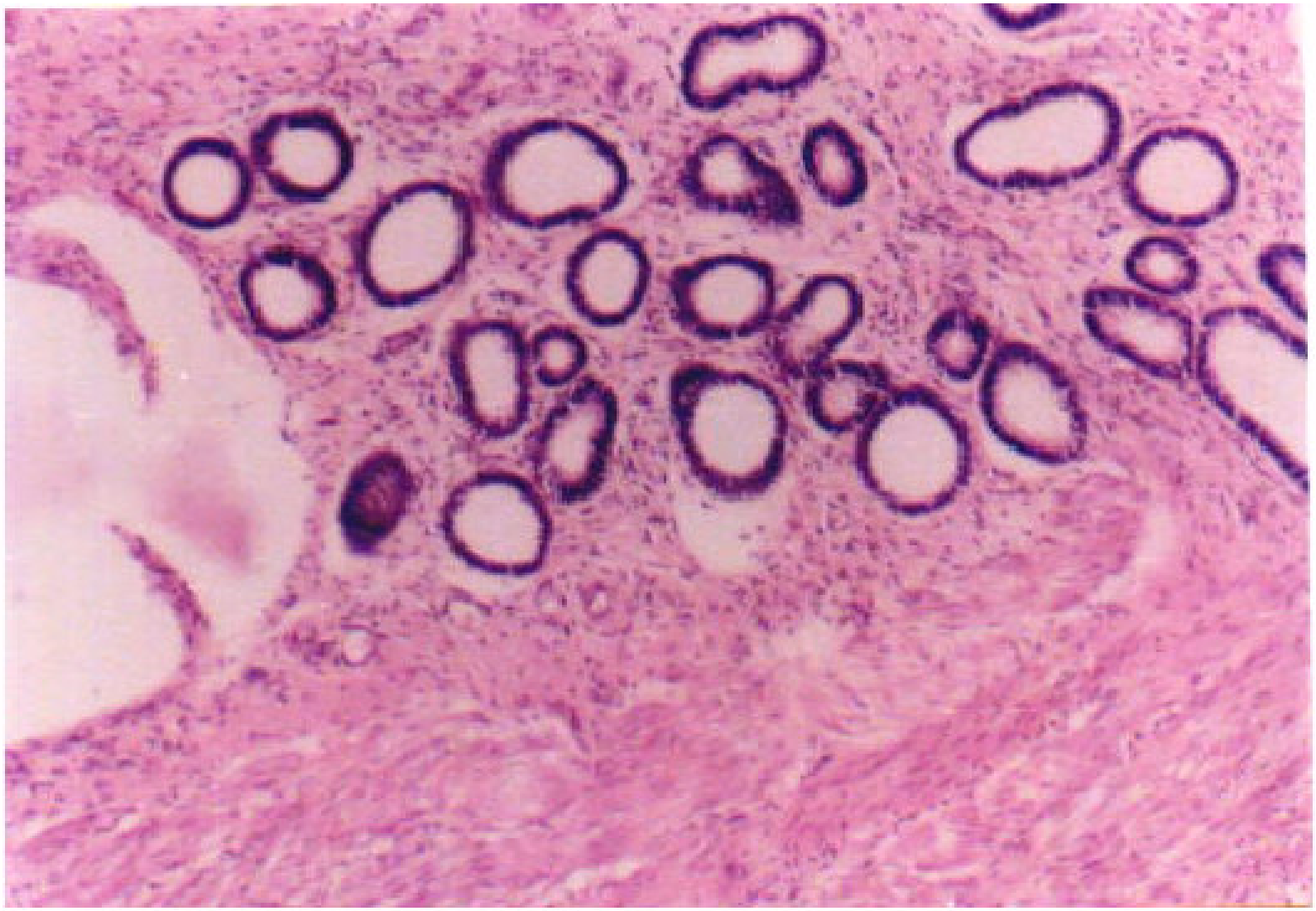
Uterus

endometritis polyposa

Uterus (mare): Cystic hyperplasia of endometrial glands



Endometrium of non-pregnant uterus showing cystic glnadular hyperplasia (H&E – X100)



**Endometrial of non-pregnant uterus showing cystic glandular hyperplasia ( H&E- X100)**

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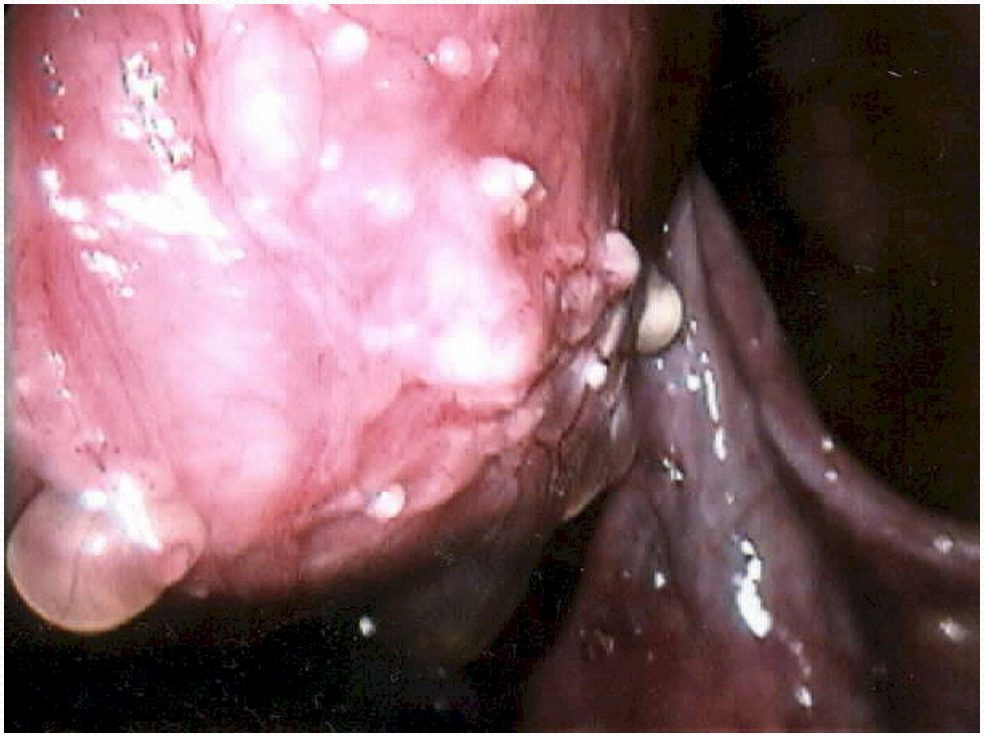
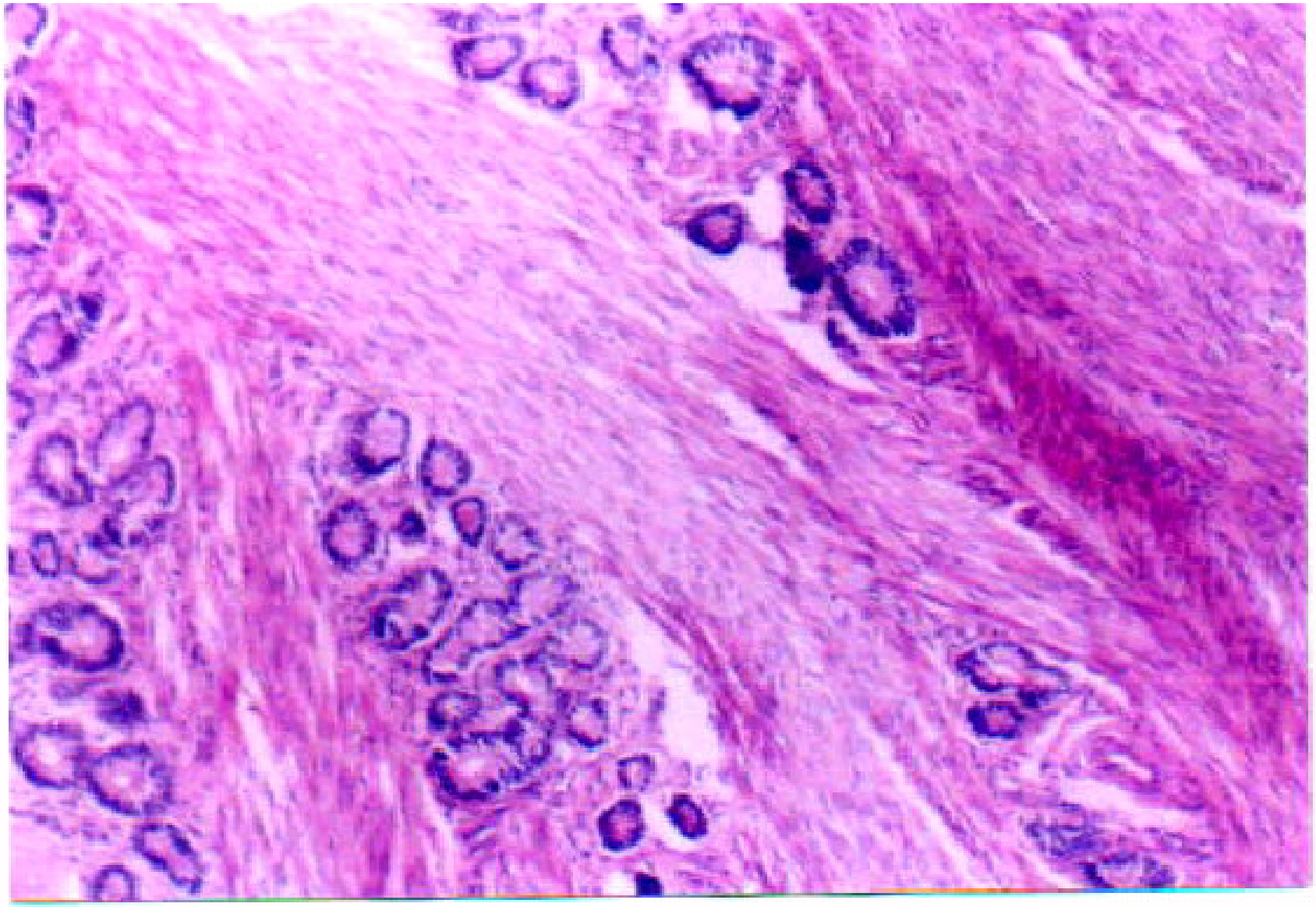
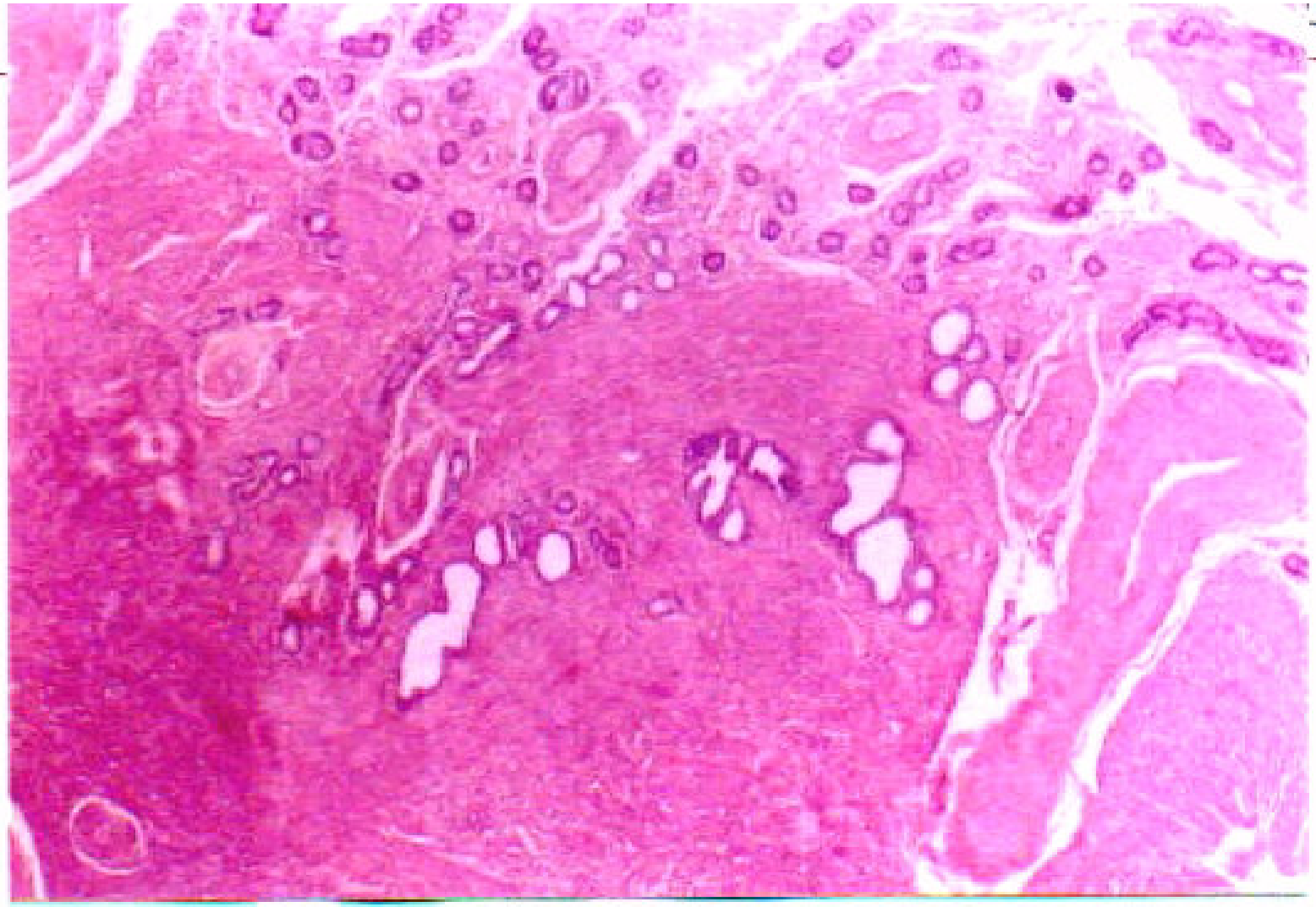




**Uterus of non-pregnant cow showing endometriosis (H&**

**– X100)**



Uterus of non-pregnant cow showing endometriosis with penetration of cystic glands in the inner circular muscle within the myometrium (H&E – X40)

Uterus

caseous endometritis

# Gravid uterus

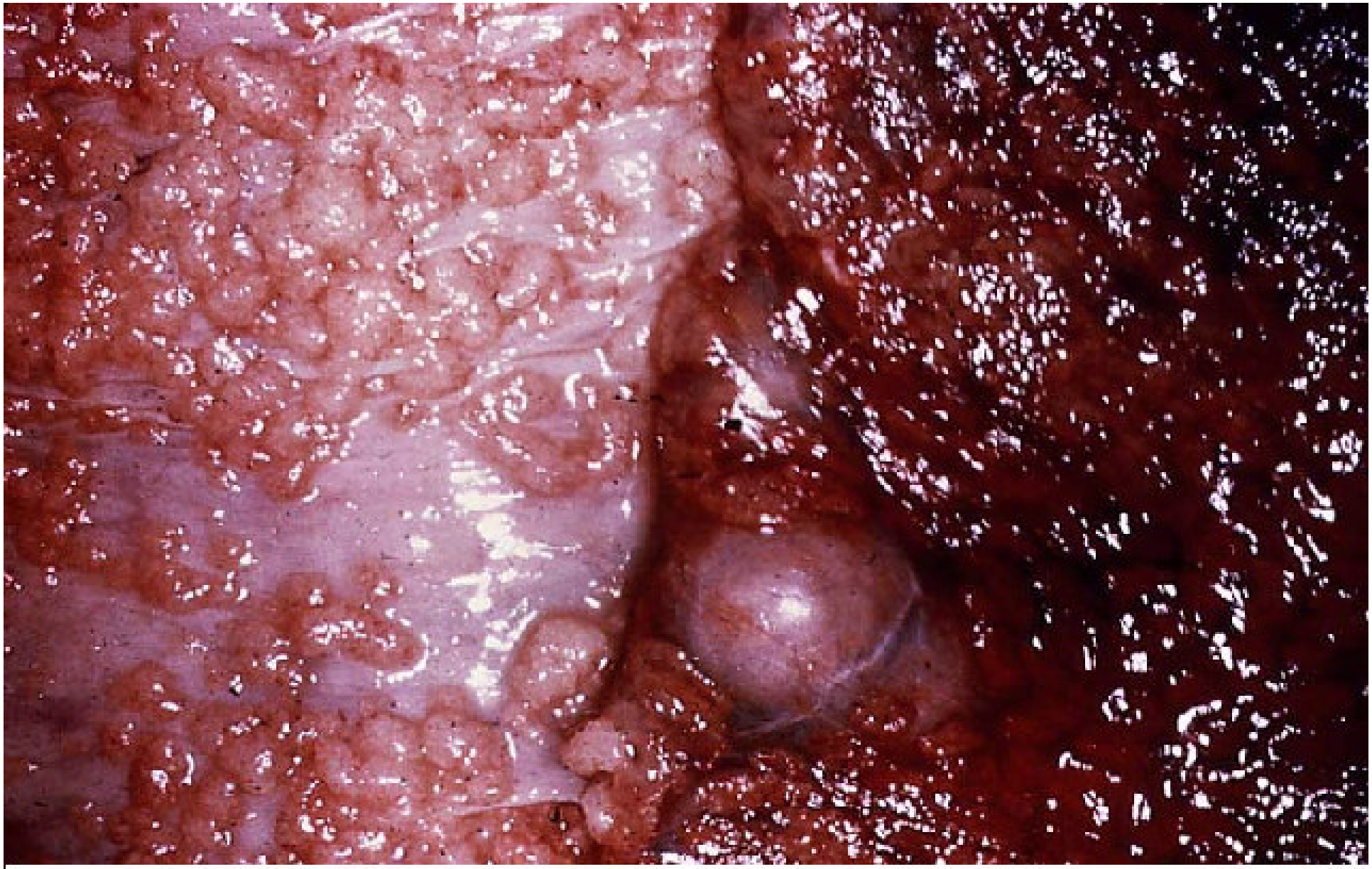
- **Adventitial Placentation**
  - **developmental of additional areas outside the normal areas, e.g. intercotyledonary in cattle.**
- **Cystic Placental Mole**
  - **It is the persistence of foetal membranes after death of the foetus**
- **Hydroamnion and Hydroallantois (nor.3-6& 6-15L)**
  - **It is the accumulation of abnormally large amount of foetal fluids in the amnion and allantois (150-200L).**
- **Placentitis**
  - **1- Necrotic Placentitis:**
  - **2- Suppurative Placentitis:**
  - **3- Proliferative Placentitis:**
  - **4- Chronic Sclerotic Placentitis:**

# Specific Infections Causing Abortion

| Cause | Cattle | Sheep |
|---|---|---|
| Brucella abortus | + | |
| Brucella melitensis | | + |
| Campylobacter (vibrio) | + | |
| Trichomonas fetus | + | |
| Leptospira | + | |
| Listeria | + | + |
| Mycoplasma | + | + |
| Rickettsia | + | |
| Toxoplasma | + | + |
| Fungi | + | + |
| IBR virus | + | |
| BVD/MD virus | + | |
| RVF virus | + | + |
| Bov.cytomeg.virus | + | |
| ECBO virus | + | |
| Bluetongue | + | + |
| Salm.abortus ovis | | + |

**Equines**

Salm.abort.equinus
Strept.genitallium
Shigella equirulis
Klebsiella genitallium
Eq.vir.rhinotracheitis
Eq.vir.arteritis



**Cow: Adventitial placentation**

**(uterus to the right and placenta to the left)**

# Inflammatory Changes

## Cervix

Cervicitis

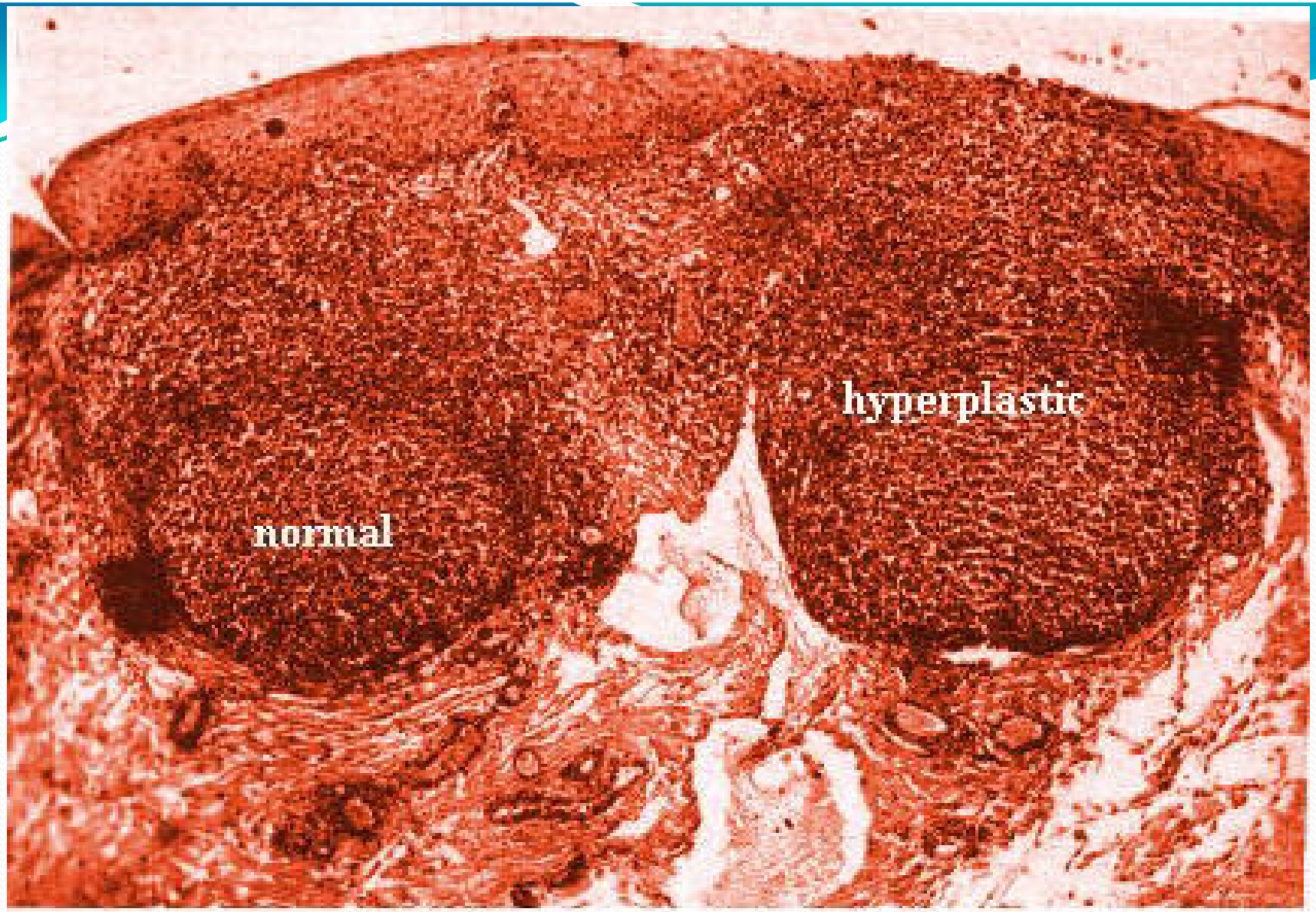
## Vagina and Vulva

Catarrhal vulvovaginitis
Granular vulvovaginitis
Pustular vulvovaginitis
Necrotic vulvovaginitis

## Placenta

Necrotic placentitis
Suppurative placentitis
Proliferative placentitis
Cronic interstitial placentitis

Septic vulvovaginitis




Infectious granular vaginitis

two lymphoid follicles in the wall of the vagina
the first is normal while the second is hyerplastic and break through the mucosa

# Mastitis

**It is the inflammation of the mammary gland**

**It occurs in many species, but it is of more importance in dairy cows.**

# Causes

**Mastitis is caused by mechanical, chemical, thermal, and infectious agents.**

- **Several bacteria invade the mammary gland causing mastitis; these**
- **bacteria are:**
- **Staphylococci - Streptococci (S.agalactia, S.dysagalactia, S.ubris, S.pyogenes, S.zooepidemicus, S.feacalis) - E.coli - Corynebacterium pyogenes - Pseudomonas aeroginosa - klebsiella - Pasteurella multocida - Bacillus cereus - Brucella abortus - Mycobacterium tuberculosis - Actinomycesbovis - Actinobacillus ligniersi -Nocardia steroides - Serratia marcescens - and others.**

# Pathogenesis

**a- Invasion phase**: Successful penetration of the microorganisms through the teat canal; this vary according to:

* Length of the teat canal.
* Patency of the teat canal.
* Structure of the teat orifice.
* Chemical factors within the teat canal (the teat canal is lined by stratified squamous epithelium which is covered by a layer of "smegma" - waxy material composed probably of epithelial debris and milk solids) - The material linning the teat canal has a bacteriostatic and/or bactericidal effects to some organisms
* Virulence of the invading organism.
* Mechanical progression of the bacteria against milk flow
* Bodily resistance (age, health, etc.).

# Pathogenesis

## * B- Infective Phase:

**In this phase, the organism after passing through the teat canal proliferate in the cisterns - this depends on:**

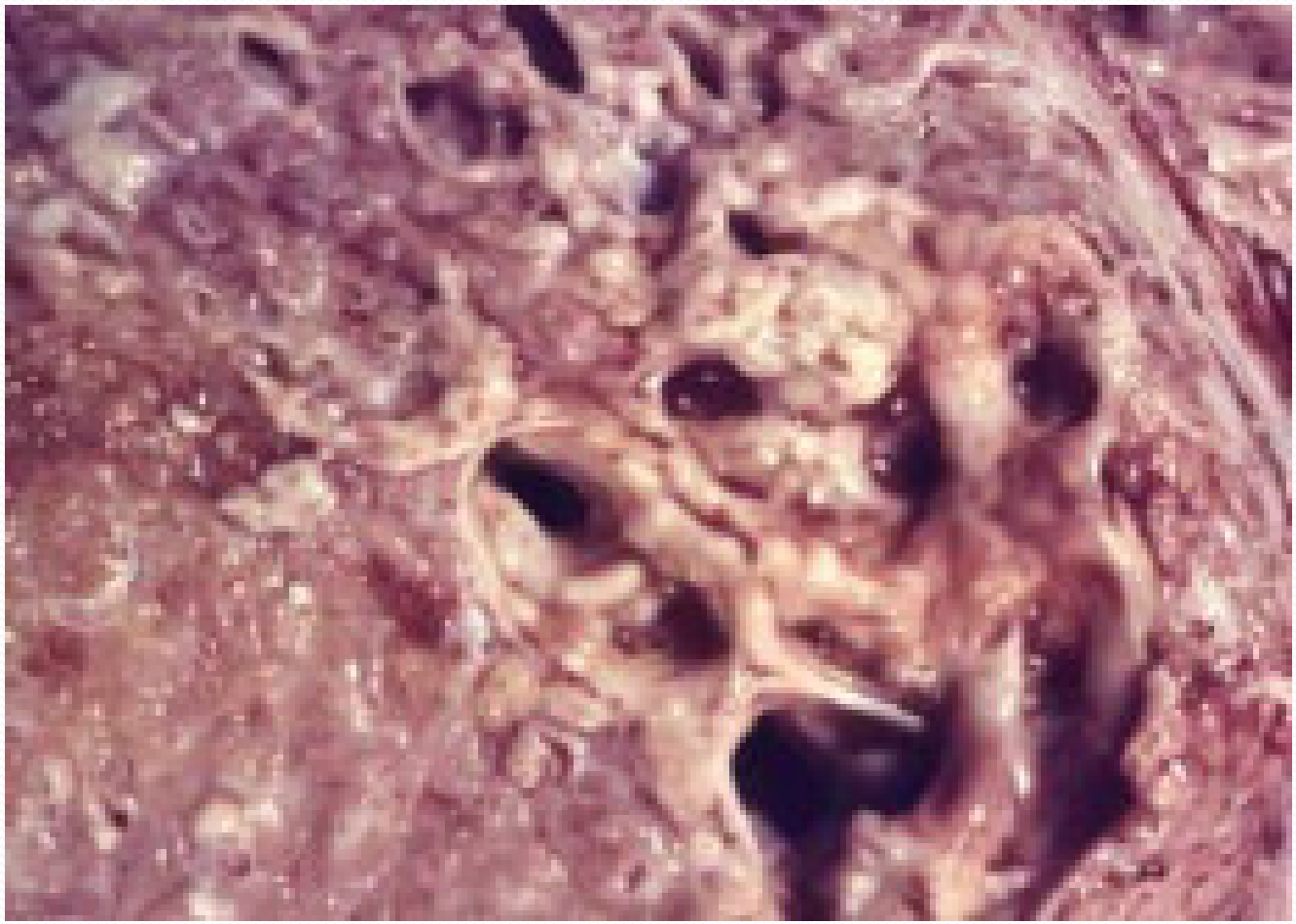
* **Inhibitory factor of milk.**
* **Defensive mechanisms by leucocytes (phagocytes).**
* **Irrigative force of milk.**

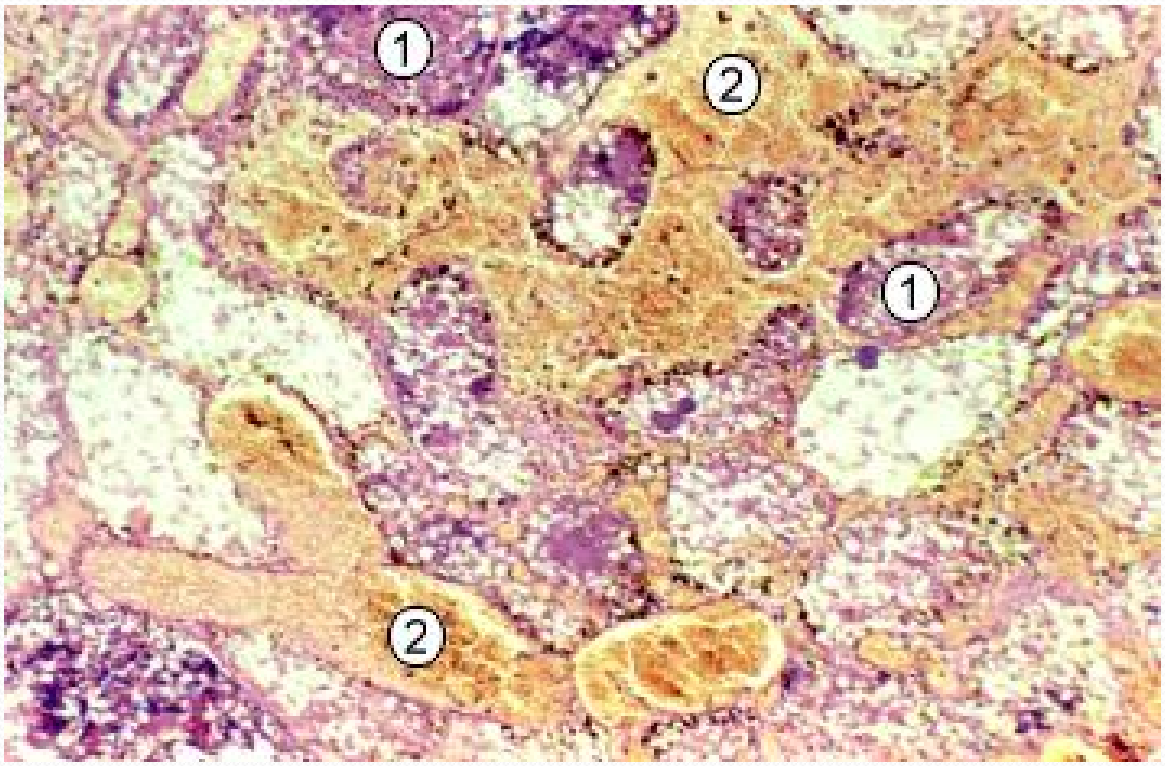
## c- Penetration of tissue:

**This is the end stage of infection by which the clinical and pathological manifestations occur.**

- **Types of mastitis**

- **Acute catarrhal mastitis: (Strept.agalactia and Strept.dysagalactia)**
- **Chronic catarrhal mastitis: (persistent streptococcal infection)**
- **Haemorrhagic mastitis: (acute stage of infection with Staphylococcus and E.coli)**
- **Suppurative mastitis: (Corynebacterium pyogenes)**
- **Granulomatous mastitis: (Staphylococcus at its chronic stage, tuberculosis, mycoplasma, nocardia, and cryptococcus)**

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