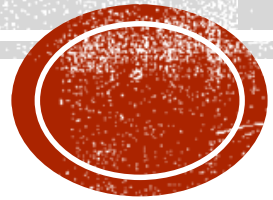
ALIMENTARY SYSTEM



CONGENITAL ANOMALIES

FACIAL CLEFTS

Meloschisis: A cleft face is called **meloschisis**

- May involve the skin only, or the deeper tissues as well.
- They are variously located. The most common is a complete cleft from one angle of the mouth to the ear of that side.
- Results from failure of fusion of the lateral portions of the maxillary and mandibular processes.

PRIMARY CLEFT PALATE (harelip, **cheiloschisis**) is a cleft palate **with cleft upper lip and jaw.**
It occurs as a result of failure of frontonal formations to fuse with maxillary formations.

Anterior to the incisive foramen.

- **Cheiloschisis** (labium laparinum)
- **Cheilognathoschisis** : cleft of the upper lip and jaw.

https://www.slideshare.net/BLACKY20081/congenital-musculoskeletal-diseases-of-domestic-animals

SECONDARY CLEFT PALATE (cleft palate, **palatoschisis**) occurs as a result of the inability to divide the oral and nasal cavities.

There is no change in the jaw and lips.

It is one of the most common anomalies observed in cattle. In lambs, it is rare, hereditary or occurs due to consumption of veratrum californicum.

Posterior to the incisive foramen.

SECONDARY CLEFT PALATE EXPOSING THE NASAL CAVITY IN A CALF.
Jubb KVF, Stent AW (2016) Alimentary system in: Pathology of domestic animals, 6th edition, vol.2, Grand Maxie m, ed., Elsevier, St. Louis, Missouri, pp. 12.

ANOMALIES OF THE GROWTH OF JAWS

- **Agnathia** : *absence of the lower jaw,*
- **Brachygnathia superior :** *shortness of the maxillae*
- **Brachygnathia inferior** (micrognathia): *shortness of the mandibles*
- **Prognathism**: *abnormal prolongation of the mandibles.*

ANOMALIES OF TONGUE

- **Aglossia** (absence of the tongue)
- **Bird tongue** (narrow tongue, especially the rostral half, where the margins are folded medially onto the dorsal surface)
- **Microglossia** (abnormal smallness of the tongue)
- **Macroglossia** (abnormally large tongue)
- **Tongue cleft** (glossoschisis)

- **Epitheliogenesis imperfecta** (an anomaly that causes widespread defects in cutaneous epithelium and also affects the epithelial lining of the oral cavity, especially the tongue.

This condition is characterized by irregular, well-demarcated, red areas because the epithelium of the oral mucosa is absent and we see it in red color).

Anomalies of pharynx

- **Gill fistule (Branchial fistule):**In animals with gills, such as fish, these clefts remain open throughout life. In mammals, these clefts may not close unilaterally or bilaterally
- **Ear fistule**: like horses, this condition is found near the outer ear hole
- **Cyst dermoid:** When Cysts are covered with cutaneous mucosa or skin containing hairs.
- **Cyst dermoid dentifer:** Cysts involving teeth

Anomalies of face

- **Aprosopia**: absence of facial bones
- **Synotia:** fusing of the ears with each other
- **Ateloprosopia:** malformation of the face
- **Otognathia:** Presence of an additional jaw with not fully developed teeth in the base of the ear
- **Cyclopia:** Fusion of both eyehole and a single eye in the midline

Diseases of the buccal cavity and mucosa

Pigmentation (**Melanotic, icterus, lead poisoning**)

- Melanotic pigmentation is normal and common in most breeds of animals and increases with age. It may be irregular, or the mucosa may be entirely pigmented.
- Diffuse yellow discoloration may be seen in icterus.

Circulatory disturbances

Pallor, cyanosis, methemoglobinemia, acute congestion and edema (**bluetongue, uremia**), hemorrhages (septicemia, equine infectious anemia, thrombocytopenic or purpuric conditions).

Foreign bodies in the oral cavity

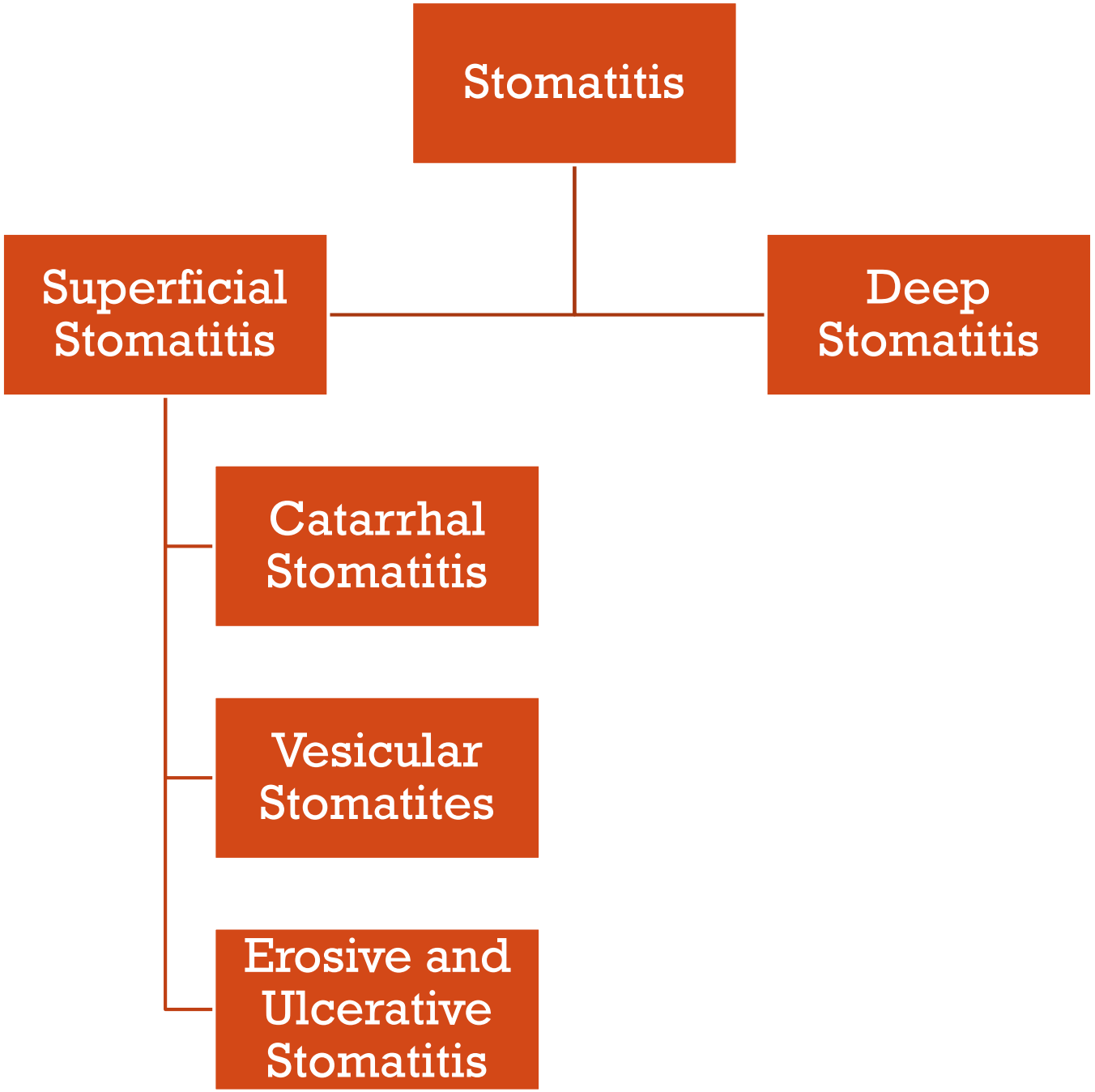
Paralysis of deglutition or semiconsciousness
Bones or other large foreign bodies (pica)
Plant fibers, burrs, quills, grass seeds and awns

INFLAMMATION

Stomatitis and **gingivitis** : inflammation of the mucous membranes of the oral cavity and gingiva, respectively.

Lesions limited to the mucosa of the oral cavity are termed ***superficial stomatitides.***

Processes seated in connective tissues of the mouth, the ***deep stomatitides***, are usually sequelae to transient superficial lesions.


Stomatitis
Superficial Stomatitis
Deep Stomatitis
Catarrhal Stomatitis
Vesicular Stomatites
Erosive and Ulcerative Stomatitis

SUPERFICIAL STOMATITIS

I**rritating chemicals** such as caustic or toxic compounds,

Electrical burns

Infectious agents.

The oral microbiota ordinarily contains many microbial species, mainly anaerobes such as ***Actinomyces, Fusobacterium,* and spirochetes,** which exist in balance with each other and in harmony with the host.

Disruption of this microfloral balance may lead to stomatitis.

I. CATARRHAL STOMATITIS

- ✓ Mucosal hyperaemia
- ✓ Submucosal oedema.
- ✓ Swelling aggravated by oedema and hyperplasia of the abundant lymphoid tissues of the soft palate, tonsil, and pharyngeal mucosa.

Oral candidiasis (trush) Candida albicans, C. tropicalis.

- Occurs most commonly in foals, pigs, and dogs.
- Proliferation of yeasts and hyphae in the parakeratotic superficial layers of the oral epithelium.

II. VESICULAR STOMATITIDES

- Characterized by the formation of **vesicles.**
- The vesicles develop as accumulations of serous fluid within the epithelium or between the epithelium and the lamina propria.
- **Vesicles → *bullae*** Vesicles may fuse to form ***bullae***, and the elevated epithelium is easily rubbed off to form **erosions.**
- If local lesions are not complicated by bacterial or mycotic infections, **regeneration and healing** occur within a few days. On the other hand, even after months, previously healed erosion foci may be seen as slightly sunken and non-pigmented areas.

DERMATOHISTOPATHOLOGY

- **Vesicle** is a *fluid filled blister less than 1 cm in diameter* in, or immediately below, the epidermis. They may be *subcorneal, suprabasilar, or subepidermal*. When these lesions contain large numbers of inflammatory cells, they may be referred to as **vesicopustules.**

DERMATOHISTOPATHOLOGY

- **Bullae** are *collections of fluid* within or below the epidermis greater than 1 cm in diameter.
- They may be caused by severe intercellular or intracellular edema, ballooning degeneration, acantholysis, hydropic degeneration of basal cells, subepidermal edema or other factors resulting in dermoepidermal separation such as the autoantibodies in bullous pemphigoid.

II. VESICULAR STOMATITIDES

- **Footh-and-mouth disease**
- Feline calcivirus
- Pemphigus vulgaris
- Bullous pemphigoid
- Vesicular exanthema
- Swine vesicular disease
- Vesicular stomatitis

FOOT-AND-MOUTH DISEASE

- *Foot-and-mouth disease (FMD) is a highly contagious viral infection of all cloven-hoofed animals.*
- Formation of vesicles
  - in and around the mouth,
  - on the feet,
  - teats,
  - mammary glands.
- Mortality ⬇ morbidity ⬆
- There are 7 principal antigenic serotypes, namely, the classical A, O, and C types, and SAT-1, SAT-2, SAT-3, and Asia-1.

FOOT-AND-MOUTH DISEASE

- *The virus enters the body through digestion or as an aerogen.*
- *The virus primarily multiplies in the mucous and lymphoid tissues of the pharynx and tonsils..*
- Virus persists in lesions for 3-8 days after the appearance of significant neutralizing titers in serum. The virus multiplying here causes viremia lasting 4-5 days.
- A focal degenerative change occurs at the entry point of the mucosa, which can only be detected histologically and is defined as **primary vesicle.**
- Later, the virus settles and multiplies in the places where the vesicles, defined as **secondary vesicles,** are formed and in organs such as lymph nodes, mammary glands, thyroid, adrenal glands and kidneys.

- The virus is present in high titers in vesicle fluids and all secretions and excretions of the body in the early period of infection.

FOOT-AND-MOUTH DISEASE

- **Lesions** develop mainly in areas subject to trauma:
- *oral mucosa*
- *the tongue (especially)*
- *the interdigital cleft; and*
- *the teats (in lactating animals)*

❖**Vesicles form**

- on the inner aspects of the lips and cheeks,
- the gums,
- hard palate,
- dental pad,
- the sides and rostral portion of the dorsum of the tongue.

Foot-and-mouth disease

- The **primary vesicles** are small, but coalesce to produce ***bullae*** which may be 5-6 cm across; these bullae **rupture** in 12-14 hours, leaving an intensely red, raw, and moist base to which shreds of epithelium may still adhere. **(erosion)**
- The eroded to ulcerated area may be replaced by regenerated epithelium in <2 weeks. Secondary infection may complicate this course.

- *Foot lesions occur in the majority of cases.*
- *There is inflammatory* swelling with blanching of skin of the **interdigital space in ruminants**, **coronet in swine**, and heels in all species a day or so before vesicles form.
- The swellings persist until the vesicles rupture and the resultant erosions heal.

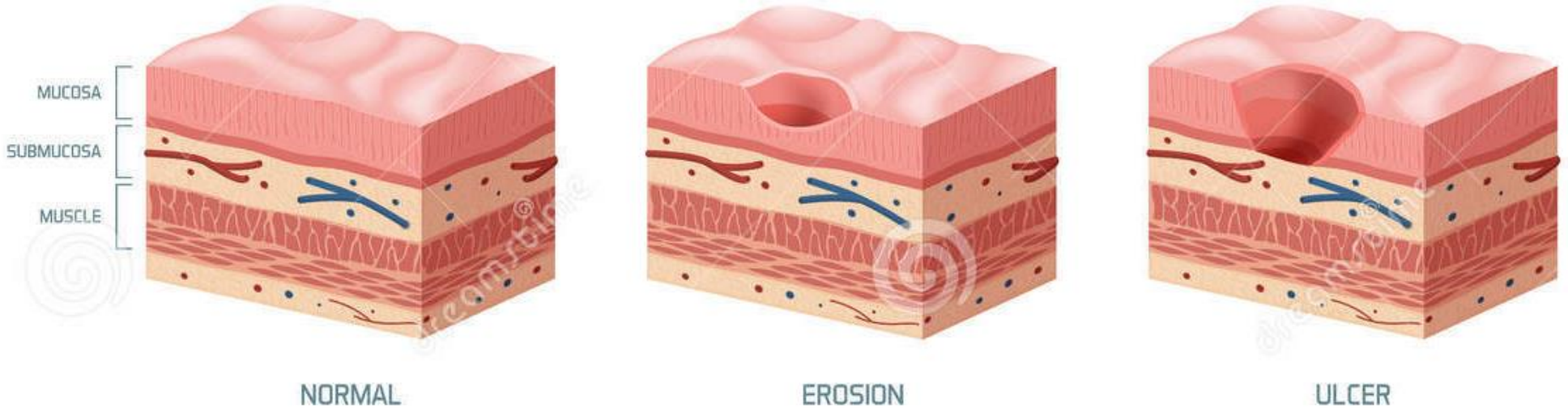
Foot-and-mouth disease

- **A *malignant form*** *of the disease****, without vesiculation****, does* occur <u>in young animals</u> and occasionally in adults.
- Death is common, as a result of ***myocarditis.***
- *Pale foci appear on the ventricle walls and papillary muscles, and the heart muscle called* "**tigerheart**".

Hyaline degeneration and necrosis occur in muscle fibers. Lymphocytes infiltrate these parts. The same disorders are also found in skeletal muscles.

FMD should be differentiated from other viral vesicular diseases such as vesicular stomatitis and diseases that cause erosive and ulcerative lesions in the oral cavity in the late stages.

III. EROSIVE AND ULCERATIVE STOMATITIDES



Erosions : a loss of part of the thickness of the surface epithelium,

Ulcers : full-thickness epithelial losses exposing the basement membrane. The ulcer may result in **loss of the all epidermis and partial loss of the dermis and subcutaneous fat layer**.

III. EROSIVE AND ULCERATIVE STOMATITIDES

- ✓ **Rinderpest**
- ✓ **Peste des petits ruminants**
- ✓ **Malignant catarrhal fever**
- ✓ **Bovine viral diarrhea-Mucosal disease**
- ✓ **Bluetongue**
- ✓ Bovine papular stomatitis
- ✓ Contagious ecthyma
- ✓ Infectious bovine rhinotracheitis
- ✓ Caprine herpesvirus
- ✓ Feline viral rhinotracheitis
- ✓ Feline ulcerative stomatitis and glossitis
- ✓ Feline plasma cell gingivitis-pharyngitis
- ✓ Eosinophilic ulcer
- ✓ Oral eosinophilic granuloma
- ✓ Horses with eosinophilic epitheliotropic disease
- ✓ Cyclic hematopoiesis (Gray collie Sendromu)
- ✓ **Uremia**

Bovine viral diarrhea- Mucosal disease

- Genus ***Pestivirus***, family ***Flaviviridae***

- Gain access to the **oropharyngeal mucosa** by ingestion or inhalation, and primary replication is in oropharyngeal lymphoid tissues, including tonsils.

- The outcome of the ensuing viremia is a product :

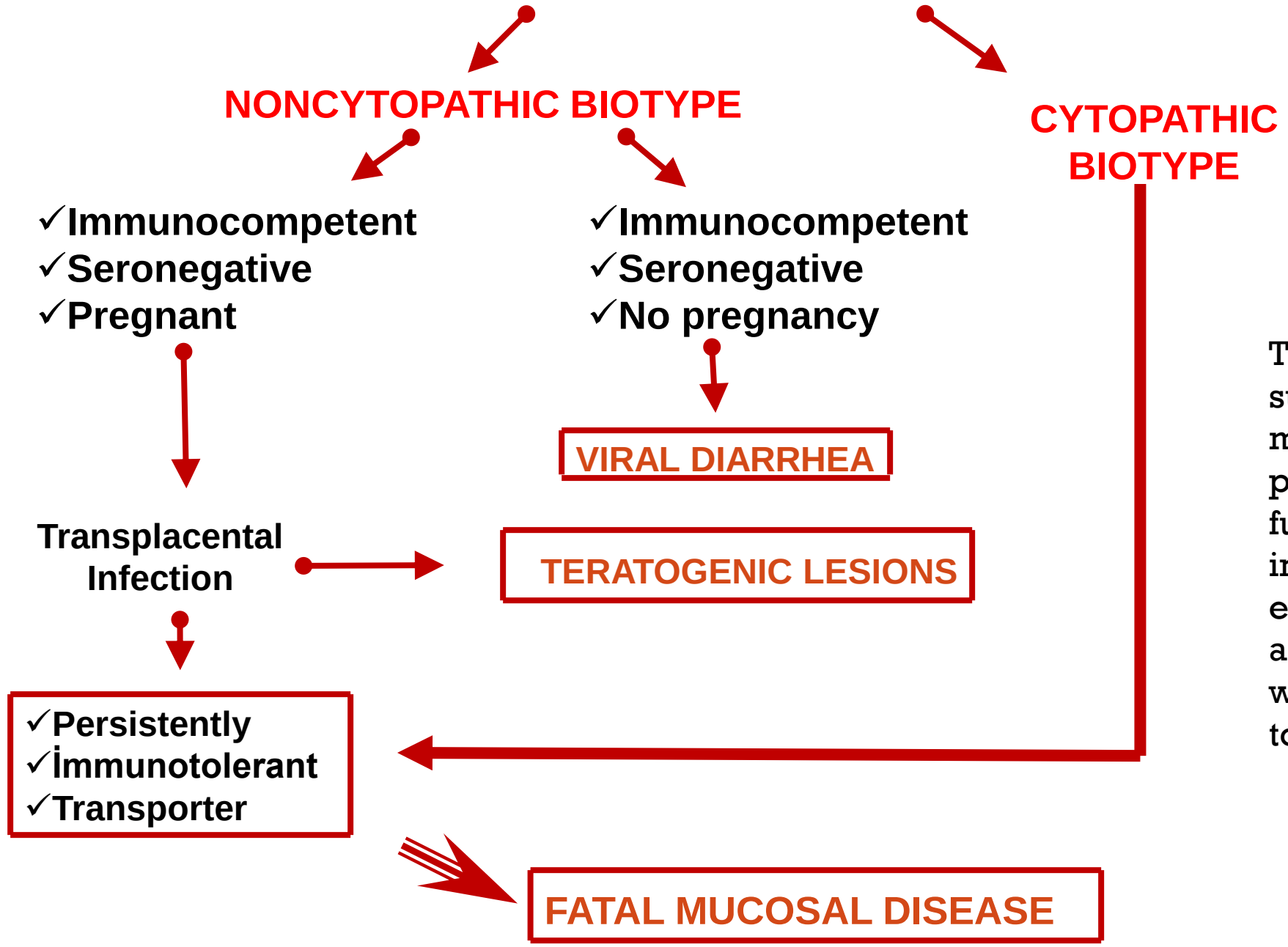
✓ **The genotype and virulence of the virus,**

✓ **The immune status of the host,**

✓ **Whether or not the animal is pregnant, and**

✓ **if so, the stage of pregnancy.**

BVD-MD VIRUS



Teratogens are substances that may produce physical or functional defects in the animal embryo or fetus after the pregnant woman is exposed to the substance.

Bovine Viral Diarrhea

- In immunocompetent, seronegative adult animals

- Low mortality, high morbidity.
- Incubation period of 5-7 days
- Lethargy, anorexia, mild oculonasal discharge, mild oral erosions and shallow ulcers, diarrhea, transient drop in milk production.
- Thrombocytopenic syndrome

- Affected animals develop neutralizing antibodies that peak in 10-12 weeks, and probably are immune for life.

PERSISTENT INFECTION

- occurs in the fetus as a result of transplacental transmission of the virus

- **Occurs** in immunocompetent seronegative cows or
- in the viremic phase of acute bovine virus diarrhea in persistently infected cows

The outcome of fetal infection is primarily dependent on the stage of gestation.
The most serious consequences occur if an NCP BVDV crosses the placental **barrier during the first 4 months of gestation**

Mostly die
if the calf survives, a **persistently infected (PI)** calf throughout its life

Persistently infected calves are clinically

-They may be normal, weak, or underdeveloped.

The proportion of such calves in a herd is usually less than 2%. Most of such calves usually get **mucosal disease** in 6 months-2 years.

Viral antigen in persistently infected animals

-Detectable in many tissues

-The amount of virus is less than mucosal disease.

-Lesions are minimal and subclinical

Fetal infection with bovine viral diarrhea virus (teratogenic lesions)

- Early embryonic death
- Abortions
- Fetal mumification

- Malformations of central nervous system
  - Microencephaly
  - Hypomyelinogenesis
  - Cerebellar hypoplasia and dysgenesis
  - Hydranencephaly-Hydrocephalus
  - Defective myelination of spinal cord

- Ocular lesions
  - Microphthalmia
  - Cataracts
  - Retinal degeneration, atrophy and dysplasia
  - Optic neuritis

- Brachygnathia
- Deformations of bones and muscles
- Alopecia
- Intrauterine infection
- Lesions of alimentary system in fetus and newborn

While abortion and mummification are observed in **the early stages of gestation** ,If the fetus is between **100-150 days old,** an immunological response and the malformations develops.

Mucosal Disease

persistently infected calves, and non-cytopathic bovine virus diarrhea viremic, immune tolerant, seronegative animals

+

if they become infected with the cytopathic biotype

=

Mucosal Diesase

- Low morbidity, high mortality.
- Commonly occurs in cattle that are 6 months to 2 years of age.
  - Mucosal disease is a clinicopathologic syndrome occurring in PI animals that subsequently become infected with a closely related CP strain.

- **In acute cases,** the animal is **febrile**, with **serous to mucoid nasal discharge**.

There is severe **diarrhea** and **tenesmus** with feces containing little or no blood or mucus.

Discrete **oral erosions** may be present.

Death occurs within 2 weeks.

- **In chronic cases**: **lethargy**, **emaciation**, **ruminal stasis**, and frequent attempts at defecation accompanied by severe tenesmus. **Interdigital dermatitis**, **dermatitis of pastern**, **coronitis**, and **laminitis** may be observed.

Gross lesions

Widespread erosions and ulcers in the digestive tract:

- The most conspicuous **oral erosions** are on the palate, the tips of the buccal papillae, and the gingiva.

- **Esophageal erosions**, a dirty brown base, longitudinal erosions.

- Oedema, hyperaemia and petechial haemorrhages in the **abomasum**.

- Similar erosions and ulcers in the **reticulorumen, omasum and intestines.**
- **Ulcers covered by diphtheroid membranes on intestines.**
- **Peyer's patches** are prominent, with necrotic masses, blood clots, or diphtheroid and fibrinous masses on their surface.
- Mucosa of large bowel is congested in **'Tiger-stripe' pattern.**

- **Fibrinous or fibrinonecrotic lesions** particularly in the **cecum and rectum**.

Characteristic Microscopic lesions

- Destruction of the epithelial lining of the crypts of Lieberkühn.

- Necrosis of lymphoid follicles in Peyer's patches.

- Hyaline degeneration and fibrinoid necrosis of submucosal and mesenteric arterioles.

Colon, with dilated and denuded glands, collapse of lamina propria, and pseudomembrane formation.

Rinderpest

Or **'cattle plague'** is a highly contagious disease of cattle.

Family *Paramyxoviridae*, genus *Morbillivirus.*

Portal of entry: nasopharyngeal mucosa

Localisation and replication in palatine tonsils and regional lymph nodes.

Viremia

Replication in all lymphoid tissues, the bone marrow, and the mucosa of the upper respiratory tract and gastrointestinal tract.

Clinically

- Severe abdominal pain,
- anorexia,
- ocular and nasal discharge,
- tachypnea,
- occasional cough,
- lethargy,
- severe dehydration and emaciation
- Death occurs in 5-8 days.

Animals that have been vaccinated or recovered from the disease develop lifelong immunity.

Gross findings characteristic but not pathognomonic.

- Gross findings may be confused with BVD-MD. Lesions that occur in the sublingual and tonsils in rinderpest are not much characterized in BVD. In addition, the erosive-ulcerative lesion observed in the entire esophagus in BVD-MD is mild in Rinderpest and forms in the upper 1/3.

- Necrotizing and erosive-ulcerative in the upper alimentary tract. Most severely affected areas in the oral cavity are those contiguous with lymphoid aggregates.

- **Caudal part of the oral cavity** is affected.

- Mild erosions in the **proximal portion of the esophagus.**

Histopathological lesions

- ✓ **Rinderpest virus has tropism to lymphoid tissues and the virus causes necrosis in lymphocytes.**
- ✓ **Necrosis in lymph nodes, spleen and Peyer's plaques becomes very evident.**
- ✓ **Necrosis in lymphocytes begins with nuclear fragmentation in the germinal centers, and all mature lymphocytes disappear in a short time.**

Histopathological lesions

- ✓ Hydropic degeneration and necrosis are seen in Stratum Spinosum and stratum basale of the oral mucosa.
- ✓ Multinucleated syncytia form in the epithelium.
- ✓ Cytoplasmic and/or nuclear inclusions in epithelial and syncytial cells
- ✓ Erosions and ulcers (**Formation of Pseudomembrane)**
- ✓ Necrosis of germinal centers of lymphoid follicles in the tonsils, peyer's patches and gastrointestinal tract.

Malignant catarrhal fever (Coryza gangrenosa bovum)

- ***Herpesvirus***
- **Fatal disease in cattle**

The disease is characterized by

- ***lymphoproliferation,***
- ***Fibrinoid necrotic vasculitis,***
- ***erosive-ulcerative mucosal cutaneous lesions.***

- **Acute, catarrhal, mucopurulent, erosive-ulcerative pseudomembranous inflammation** were seen.

Cattle between 6 months and 2 years of age are more susceptible to the disease.

The entry site of the virus into the body is the upper respiratory tract and tonsils.

Malignant catarrhal fever (Coryza gangrenosa bovum)

Symptoms:

- Fever,
- depression,
- profuse nasal and ocular discharge and
- encrustation,
- drooling of saliva,
- photophobia,
- keratitis,
- erosion and diphtheresis of oral membranes,
- generalized lymphodenopathy,
- skin lesions.

Peracute Form

- Fever
- Hemorrhagic diarrhea and death within a few days
- Erosion and ulcers in the oral mucosa
- Erosion and ulcers in the abomasum and intestines in the 1/3 of the esophagus

Acute Intestinal Form

- Fever
- Diarrhea
- Exanthema
  Lacrimation
- Enlargement of lymph nodes
- Erosion and ulcers in the oral mucosa
- Death

Head-Eye Form

- Fever
- Catarrhal conjunctivitis and rhinitis
- Erosive-ulcerative stomatitis from catarrhal stomatitis
- Eye-nasal discharge and crusting
- Keratitis - white appearance in the eyes
- Meningoencephalitis

Abortive Form

Main lesions:

- **Keratoconjunctivitis,**
- **nonpurulent meningoencephalitis,**
- corneal opacity,
- focal **nonpurulent interstitial nephritis.**

❑ Characteristic histologic change:

Fibrinoid necrotizing vasculitis in medium-sized arteries.

Bluetongue

- **Genus *Orbivirus*, family *Reoviridae*.**
- Sheep, goats, and cattle
- Spread by vector competent *Culicoides* spp.

- Viral infection causes **endothelial damage** which initiates local **microvascular thrombosis and permeability.**

- **Ischemic necrosis** of many tissues**; edema** caused by vascular permeability; and **hemorrhage** resulting from vascular damage.

- Nasal discharge, fever, focal hemorrhage on the lips and gums, the **tongue** may become edematous and congested or **cyanotic** (Bluetongue)

.

- **Pathognomonic gross lesion for bluetongue** is focal **hemorrhage**, petechial or up to 1 cm wide × 2-3 cm long, in the **tunica media at the base of the pulmonary artery.**

- **Petechial hemorrhage** also may be present at the **base of the aorta** and in **subendocardial** and **subepicardial** locations over the heart.

There also may be edema and petechial or ecchymotic hemorrhage in the pharyngeal and laryngeal area.

Animals with pharyngeal or esophageal myodegeneration may die due to the aspiration pneumonia.

Extensive ecchymotic subepicardial haemorrhages

- Laminitis, characterized by hyperemia and edema of the sensitive laminae at the coronet, may be apparent, and in some cases.

- This disease also causes meningoencephalitis in the fetus transplacentally in gestation.
- It should be added that it has teratogenic effects.
- **In the first trimester,** hydranecephaly, porencephaly, retinal dysplasia arthrogryposis are seen;
- Porencephaly **in the second trimester;**
- It causes mild focal meningoencephalitis **in the last trimester.**

UREMIA

- Dogs and cats
- Chronic kidney failure
- Ulcerative stomatitis with foul odor
- Buccal mucosa and especially tongue dark cyanotic
- Ammonia formation and has a corrosive effect on the mucous membrane.
- Elevated urea levels in the blood and saliva create a tendency to bacterial infection, and urease-producing bacteria normally found in the oral microflora generate ammonia from the urea in saliva.

Uremic Ulcers, Hard Palate, Dog.
Ulcers present on the transverse palatine ridges and periodontal gingiva are secondary to vascular damage associated with increased concentrations of plasma blood urea nitrogen and creatinine from kidney failure. Affected animals often have an ammoniacal or uremic odor to the breath.

Brown DL, Van Wettere AJ, Cullen JM (2017) Alimentary system in: Pathologic Basis of Veterinary Disease, 6th edition, Zachary JF, ed., elsevier, St. louis, Missouri, pp. 345.