VPM 221

- **Recommended Textbook:**
  ✓ Pathologic Basis of Veterinary Medicine, Zachary & McGavin, 5th ed. 2011

- **Complementary textbooks:**
  ✓ Tumors in Domestic Animals, Meuten, 4th ed. 2002
  ✓ Pathologic basis of disease, Kumar Abbas & Fausto, 8th ed. 2005

*Website: [http://people.upei.ca/eaburto](http://people.upei.ca/eaburto)*
The Big Picture

- Stomatitides
- Oral tumors
- Esophagitis, megaesophagus & choke
- Ruminal tympany
- Grain overload
- Gastric dilation & volvulus (GDV)
- Gastric ulcers
- Intestinal obstructions
- Enteritis & diarrhea (neonates & adults)
Introduction

- Oral cavity (teeth, tonsils, salivary glands & tongue)
- Pharynx
- Esophagus
- Stomach (simple or complex)
- Intestines
- Liver & pancreas

Functions:
- Ingestion
- Grinding & mixing (digestion)
- Absorption of nutrients
- Metabolism
Introduction

- Alimentary disorders: frequent and important
- Type of disease varies (species & age)
- Diagnostic procedures include
  - Clinical exam – endoscopy, U/S, laparoscopy, radiology
  - Biopsy
  - Fecal exam
  - Necropsy
  - Other lab tests

[Image: http://en.wikivet.net/Lymphangiectasia]
Normal gross appearance

Smooth & shiny serosal surfaces, dog’s abdominal cavity and viscera

Smooth & shiny mucosal surface, abomasum, calf

Ruminal mucosa, cow
Predisposing Factors to GI Disease

- Direct exposure to environment
- Management/husbandry factors
- Age
- Loose suspension in abdomen

Neonatal diarrhea; colibacillosis. *Noah’s arkive*

Mesenteries of a horse
Portals of entry of pathogens

- Ingestion (most common)
- Coughed up & swallowed
- Systemic blood-borne infections
- Parasite migration

*Image: Spirocercia lupi esophagus, dog*  
*Image: Hookworms (Ancylostoma caninum), small intestine dog*
Protective Mechanisms

- Endogenous secretions
- Resident flora and fauna
- Vomiting
- Increased peristalsis (diarrhea)
- Rapid epithelial turnover
- Local immune response

Enterocyte turnover.

http://www.jpp.krakow.pl/journal/archive/06_05_s3/articles/02_article.html
Basic Reactions of GI tract

- Cellular degeneration and necrosis (vesicles, erosions, ulcers, villous atrophy)
- Inflammation
- Cell proliferation and neoplasia
- Altered physiology (secretion, absorption & motility)

Gingival hyperplasia, red fox

Gastric ulcers, foal

Villous atrophy, ileum, piglet. *Noah’s arkive*
Signs of GI Disease

Specific
- Dysphagia
- Regurgitation
- Vomiting
- Diarrhea

Abnormal evacuations
- Hematochezia
- Melena

Unspecific
- Weight loss
- Abdominal pain
- Suboptimal performance

Melena caused by a gastric ulcer; pig.
I. Diseases of Oral Cavity

1. Developmental abnormalities
2. Inflammatory diseases
3. Neoplasia
1. Developmental Abnormalities

1.1 Palatoschisis (cleft palate)

- Failure of fusion of the lateral palatine processes of the maxillary bone
1. Developmental Abnormalities

1.1 Palatoschisis (cleft palate)
- Genetic (Charolais, along with arthrogryposis)
- Toxic plants in cattle, sheep & pigs
- Steroid administration (primates)
- Results in starvation or aspiration pneumonia & death

Lupinus formosus

Veratrum californicum

Crotalaria retusa

Arthrogryposis, piglet
1. Developmental Abnormalities

1.1 Cheiloschisis (cleft lip or hare lip)

- Failure of fusion of the upper lip along the midline or philtrum
- May be uni- or bilateral, superficial or extend into the nostril
- Usually of no clinical significance
1. Developmental Abnormalities

1.2 Epitheliogenesis imperfecta

- Incomplete development of the stratified squamous epithelium of skin, adnexa, and/or oral mucosa.
- Small lesions heal by scarring
- May lead to abortion, bacterial infection or dehydration (if extensive)

Tongue (histo). Epithelium is present on the right (arrow) but is abruptly missing on the left.

Epitheliogenesis imperfecta, foal (top) and bovine tongue (bottom). Noah’s arkive
a) Inflammation of the mouth – Some terminology

- Stomatitis
- Cheilitis
- Glossitis
- Gingivitis
- Pharyngitis
- Tonsillitis
- Sialoadenitis
a) Inflammation of the mouth – Some terminology

- Stomatitis - general term
- Cheilitis - lips
- Glossitis - tongue
- Gingivitis - gums
- Pharyngitis - pharynx
- Tonsillitis - tonsils
- Sialoadenitis - salivary glands
b) Causes of stomatitis

- Infectious agents
- Trauma
- Chemical injury
- Auto-immune
- Systemic diseases
- Idiopathic
c,d) Stomatitis

- Important indicator of some systemic diseases.

- Morphological changes:
  - Macules (redness)
  - Papules
  - Vesicles (blisters)
  - Erosions
  - Ulcers
  - Necrosis & pseudomembranes
  - Granulomas

Necrotizing stomatitis; Necrobacillosis, bovine. Note the extensive area of coagulative necrosis involving the dental pad and hard palate. *Noah’s arkive*
**Macule:** Circumscribed lesion, 1 cm or smaller in diameter, characterized by flatness and distinguished by coloration (white, black, red, etc.)

Multifocal hyperpigmented macules.

*Google image.*

Erythematous macule. Skin, dog.

*Pathologic Basis of Veterinary Disease, 4th ed., Mosby-Elsevier*
2.1 Vesicular stomatitis

- May be caused by a variety of agents
- **In dogs & cats:**
  - Rule out auto-immune disease
  - Calicivirus infection in cats
- **In food/large animals:**
  - Rule out major viral diseases

**Vesicle:** Fluid-filled raised lesion 1 cm or less across (**Bulla** is greater than 1 cm. **Blist**er is the common term for either)

Vesicular glossitis, **Feline calicivirus.**

*Noah’s arkive*
Intact (i) & ruptured (r) vesicles, pig, Vesicular exanthema.

Pathologic Basis of Veterinary Disease, 4th ed., Mosby-Elsevier

Microscopic appearance of a vesicle (v), human. There is a large space dissecting the epidermis (e). C: stratum corneum, d: dermis.

Downloaded from: Robbins & Cotran Pathologic Basis of Disease
Pathogenesis of vesicular stomatitis

- Epithelial damage (viral) → intracellular edema (ballooning degeneration) → cell lysis → vesicle / bulla → rupture → erosions / ulcers → cellular infiltration → scab / granulation tissue

- Lesions present in any stratified epithelium

Ballooning degeneration of keratinocytes (arrows) leading to vesicle (V) formation. Epidermis (e) and dermis (d).

*Pathologic Basis of Veterinary Disease*, 4th ed., Mosby-Elsevier
Another possible mechanism for blister formation

All forms of pemphigus are caused by IgG autoantibodies against desmogleins. The antibodies seem to function primarily by directly disrupting the intercellular adhesive function of the desmosomes and may activate intercellular proteases as well.

Squamous cell adhesion molecules
**Acantholysis:** Loss of intercellular cohesion between keratinocytes

**Pemphigus vulgaris, dog.** Suprabasilar clefting has left a row of basal cells (*arrows*) attached to the dermis. The single row of basal cells is fragile and easily damaged leading to formation of ulcers, with subsequent fluid loss and secondary bacterial infection.

Direct immunofluorescence. There is deposition of immunoglobulins along the plasma membranes of epidermal keratinocytes in a fishnet-like pattern.
2.1 Vesicular stomatitides

Viral etiologies

- Foot and mouth disease
- Vesicular stomatitis
- Swine vesicular disease
- Vesicular exanthema
2.1.1 Foot and Mouth Disease
FMD, Aphthous fever
(Most dreaded animal disease in the world)

- Caused by a picornavirus (7 antigenic types)
- Highly contagious, high morbidity, low mortality
- Affects mainly ruminants and pigs
- Viral ingestion or inhalation → pharynx → viremia → epidermis → lesions in sites subjected to mechanical injury
- Signs: drooling saliva, lameness, etc.
FMD Lesions

▪ Vesicles/bullae ➔ rupture ➔ erosions/ulcers ➔ scab formation in oral mucosa, feet and teats

FMD, cows. Notice intact (left) and ruptured/ulcerated (right) vesicles on tongue. *Noah’s arkive*
FMD Lesions

- Myocardial degeneration & myocarditis in neonates $\rightarrow$ acute heart failure

FMD, lymphocytic myocarditis (arrows), calf. *Noah’s arkive*

FMD, large ruminal ulcer, cow
FMD Lesions

- Complications include
  - Secondary bacterial infections
  - Hoof separation