VI. Diseases of Stomach & Abomasum

- Physical influences
- Gastric Ulcers
- Gastritis
- Parasitic Diseases
- Neoplasia
1. Physical Influences

1.1 Acute gastric dilation & volvulus (GDV)

1.2 Abomasal displacement

1.3 Gastric dilation, impaction & rupture
1.1 GDV - Pathogenesis

- Large dog breeds, rarely pigs.
- Large meal (dry or highly fermentable)
- Failure of eructation & pyloric outflow
- Xs gas / functional obstruction of cardia & pylorus → dilation → rotation on its mesenteric axis (volvulus)
- Compression of diaphragm, vena cava & portal vein → ↓venous return → ↓cardiac output & perfusion to abd viscera (MDF*) → shock
  *release of myocardial depressor factor from an ischemic pancreas

Schematic illustration of gastric dilation and volvulus.
Gastric dilation and volvulus, dog. The stomach is filled with fluid and gas and the serosa is congested. The spleen is engorged, and displaced to the right and cranially.

**GDV**

**Gross changes:**
- Severe abdominal distension
- Clock-wise rotation on a ventrodorsal axis (180-360 degrees)
- Hemorrhagic infarction
- Rupture of stomach
- V-shaped bending of enlarged spleen
- Congestion of intestines
GDV, V-shaped bending of enlarged spleen

GDV, Stomach rotates on its mesenteric axis

GDV, compressed caudal vena cava (decreased venous return to the heart)
1.2 Abomasal displacement (LDA & RDA)

- **LDA** mostly in dairy cows
  - Common GI disorder requiring surgery (seldom fatal)
  - Older, high producers
  - Postcalving period

- High grain diet → **atony** →↑ production of gas
- Recent parturition → displacement to the cranial left abdomen → obstruction → HCl secretion → chloride sequestration → hypochloremia & metabolic alkalosis

- Sequelae: ulceration & fibrous adhesions

- **RDA** (15%) cows and calves
  - Overdistended abomasum → right and dorsal displacement with rotation (volvulus) → venous infarction → rupture
  - Sequela: vagus nerves trauma → vagus indigestion → 2ary bloat
Abomasal volvulus and dilation, calf. The abomasum (a) is normally on the abdominal ventral midline but here, it is displaced to the right and dorsally.

Abomasal volvulus and dilation, calf. Note the serosal congestion.
1.3 Gastric dilation and rupture

- In horses
  - Fermentable CHO, lush pasture, Excessive water intake
  - Secondary to intestinal obstruction; equine dysautonomia
  - Distinction: ante mortem from post mortem rupture

Stomach rupture, horse. Note that the lacerated borders are diffusely hemorrhagic and congested

Rupture, stomach, horse. The hemorrhage on the margins of the rupture is indicative of an antemortem event. The rent through the tunica muscularis (arrows) is longer than that through the mucosa (*) which still covers the ingesta. Courtesy of Dr. Lopez
1.3 Gastric / abomasal impaction

- Low quality roughage; low water intake; poor mastication
- Vagal nerve damage ("vagus indigestion"); pyloric stenosis
- Hypochloremia, hypokalemia, metabolic alkalosis
- Abomasal emptying defect (Suffolk sheep)

Abomasal impaction, cow.

Gastric impaction, horse. The organ is abnormally packed with dry ingesta.

http://w3.vet.cornell.edu/nst/nst.asp
2. Gastric ulcers

- Important but less so than in humans

- Imbalance between acid secretion & mucosal protection (*gastric mucosal barrier*)

- Epithelial necrosis $\rightarrow$ erosion $\rightarrow$ ulceration $\rightarrow$ bleeding $\rightarrow$ perforation $\rightarrow$ peritonitis

- Main signs:
  - Hematemesis
  - Melena
  - Anemia
  - Abdominal pain

*Ulcer*, stomach, dog. There is a large volume of clotted blood from the ulcer.
Schematic illustration of gastric ulcer formation in humans

NORMAL

**Damaging Forces:**
- Gastric acidity
- Peptic enzymes

**Defensive Forces:**
- Surface mucus secretion
- Bicarbonate secretion into mucus
- Mucosal blood flow
- Apical surface membrane transport
- Epithelial regenerative capacity
- Elaboration of prostaglandins

INJURY

**H. pylori** infection
- NSAID
- Aspirin
- Cigarettes
- Alcohol
- Gastric hyperacidity
- Duodenal-gastric reflux

**Increased Damage or Impaired Defenses:**
- Ischemia
- Shock
- Delayed gastric emptying
- Host factors

PEPTIC ULCERATION

Necrotic debris (N)
- Nonspecific acute inflammation (I)
- Granulation tissue (G)
- Fibrosis (S)

KUMAR ET AL 2005
Gastric Ulcers - Etiologic Factors

- Local mucosal injury

- High gastric acidity
  - Mast cell tumors (histamine)
  - Zollinger-Ellison syndrome (hypergastrinemia)

- Local ischemia (stress ulcers)

- Steroids & NSAIDs (aspirin)
  - Interference with PG synthesis
  - Direct epithelial necrosis

- Others
  - Diet, infections, uremia (ammonium anions & vasculopathy)
  - Role of *Helicobacter* spp undetermined in animals

*Helicobacter sp.* Large numbers of spiral bacteria (arrow) on the surface of the gastric mucosa, dog
Ulcers. In calves, gastric ulcers may perforate (top left) and cause fatal peritonitis. In pigs, they occur as a oval or rectangular crater (top right), often as incidental finding, but could be fatal. In dogs, they are more common in the duodenum and may result from mast cell tumors (bottom left). In horses, lesions are often subclinical and affect the squamous mucosa (bottom right).
3. Gastritis

- **Dogs & cats**
  - Uremia
  - Eosinophilic gastritis (parasitic/allergic reaction?); scirrhous form.
  - *Helicobacter* spp?
  - Chronic gastritis → mucosal atrophy/hypertrophy
  - Hypertrophic gastropathy (BBBB)

- **Pigs**
  - Sepsis: Colibacillosis, salmonellosis, etc.

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**Gastric infarct** (area of hemorrhage), septicemia, glandular mucosa, pig.

**Hypertrophy of the gastric mucosa** (Hypertrophic gastropathy), dog. Note the prominent folds and redundant “cerebriform” mucosa.
3. Gastritis

- **Cattle, sheep & goats**
  - *C. septicum* (**Braxy** or bradsot)
  - *C. perfringens* type A (Abomasitis with ulceration)

**Braxy.** Acute, hemorrhagic abomasitis, lamb (right top), with submucosal gas pockets (emphysema) and edema, calves (left & bottom right).
Mycotic gastritis

- *Mucor, Rhizopus, Absidia, Aspergillus* spp

- Predisposing factors:
  - Viral infections
  - Antibiotic therapy
  - Endotoxemia
  - Steroids
  - Neoplasia

Multifocal hemorrhagic infarcts, **mycotic abomasitis**, bovines.
4. Parasitic diseases

- **Ruminants**
  - Haemonchosis
  - Ostertagiosis
  - Trichostrongylosis

- **Equine**
  - Gastric bots
  - Draschia megastoma
  - Trichostrongylosis

- **Swine**
  - Hyostrongylosis
4.1 Ruminants

4.1.1 Haemonchosis

- *Haemonchus contortus* – sheep & goats
- *H. placei* – cattle
- Average blood loss – 0.05 ml / parasite / day

Haemonchosis. Abomasal parasitism, sheep. Blood within the gut of the parasite causes the characteristic barber's pole appearance (inset).

Pathologic Basis of Veterinary Disease, 4th ed., Mosby
4.1 Ruminants

4.1.2 Ostertagiosis (types I & II)
- *Teladorsagia circumcincta* – sheep & goats
- *O. ostertagi* – cattle
- Mucous metaplasia/hyperplasia
- Achlorhydria, diarrhea, hypoproteinemia, wasting

4.1.3 Trichostrongylosis
- *Trichostrongylus axeii*

*Ostertagiosis*, bovine. Notice the nodular lesions resulting from mucous metaplasia and hyperplasia of epithelium lining glands.
4.2 Equine

4.2.1 Gastric bots
- *Gasterophilus intestinalis* – squamous portion of the mucosa
- *G. nasalis* – glandular portion

4.2.2 *Draschia megastoma*
- Tumor-like nodules & ulcers
- Glandular mucosa

4.2.3 Trichostrongylosis

4.3 Swine

4.3.1 Hyostrongylosis
- *H. rubidus*

*Draschia megastoma* (ulcerated nodules in the glandular mucosa) & *G. intestinalis*, stomach, horse.
5. Neoplasia

Primary gastric tumors are uncommon in animals

5.1 Lymphoma

Gastric and abomasal lymphomas, dog (left) and bovine (right). Multifocal, nodular, sometimes ulcerated, masses.
5. Neoplasia

5.2 Squamous cell carcinoma (horses)

5.3 Adenocarcinoma (dogs)
   - Ulcerated plaques or nodules
   - Marked scirrhous reaction (desmoplasia)
   - Metastases common

5.3 Adenomas (often pedunculate)

5.4 Leiomyomas & leiomyosarcomas