VET-114
Animal Anatomy and Physiology 2

Webinar – Chapter 11

Digestive System
A Warm Welcome from My Faculty TEAM and Me!!!😊
The Pledge of Allegiance

"I pledge allegiance to the flag of the United States of America, and to the republic for which it stands, one nation under God, indivisible, with liberty and justice for all."
Tribute to Our Military Students and Their Spouses!
Scranton Meet-Up! Streaming Live!

WE’RE LIVE!
Say hello to remote staff and classmates through our meetup live-stream!
The “Jersey Girls”! 😊
Lisa Hughes Graduating!!!
Heather Geyer – National Award!
Heather Geyer
DEAC Graduate of the Year,
Veterinary Technician Associate Degree
Are You Using the Course Spaces?
New “Medical Terminology Game”!

About The Vet Tech Terminology Challenge

Doctors and professionals use a variety of medical terms in their offices every day. Having a standard terminology allows teams to run more smoothly and helps speed up response and reaction time, improving patient care. Learn more.

- **Anatomy + Physiology**: Identify body parts within systems
- **Fill in the Blanks**: Use correct terms in a sentence
- **Flash Cards**: Self-test your knowledge of important terms
- **Pronunciation**: Practice saying terms out loud
- **Spelling**: Listen to a term, then spell it
- **Word Builder**: Practice using prefixes, root words, and suffixes

[Image of the interface]
The Digestive System
Chapter 11
Pages 264-282
• List the functions of the digestive system.
• Describe the epithelial and muscle layers of the gastrointestinal tract.
• Explain the process of peristalsis.
• List the structures of the oral cavity.
• List and give the locations of the salivary glands.
• Name the types of teeth found in carnivores and herbivores and describe the structure of teeth.
• Differentiate between mechanical and chemical digestion.
• List the structures that make up the monogastric stomach and describe the function of each area.
• Explain the effect(s) on the gastrointestinal system of amylase, lipase, gastrin, pepsin, pepsinogen, prostaglandins, mucin, bicarbonate, secretin, cholecystokinin, proteases, and hydrogen and chloride ions.
• Describe the structure and functions of the rumen, reticulum, omasum, and abomasum.
• Differentiate between fermentative and nonfermentative digestion.
• List the segments of the small and large intestine and describe the general functions of each segment.
The Digestive System

- Gastrointestinal tract (GIT)
- Alimentary canal
Putting Things in Perspective! 😊

VERY important system clinically!
Here, Moochie, I thought you might like this.

HA! HA! HA! HA! HA!

Mr. Mooch's Class

Biology

'Canis Bad Breathus'
"I'm afraid Sidney has foot and mouth disease, Mrs Snoddy - and for a gastropod that's about as bad as it gets"
The “Tracts” of Internal Medicine
The Digestive System (GIT)

Figure 11-1, Page 265

- Digestive tract, gastrointestinal (GI) tract, alimentary canal, gut
- Tube that runs from the mouth to the anus; accessory digestive organs
Basic Functions of GIT

Digestion of Macronutrients
Absorption of All Nutrients
Elimination of Wastes
Digestion of Macronutrients

- Definition – large nutrient molecules that require breakdown into smaller molecules before being absorbed
  - “Energy” nutrients (Calories)
  - Carbohydrates
  - Fats
  - Proteins
Digestion of Macronutrients

- Carbohydrate
  - Monosaccharides
- Lipid
  - Fatty acids
  - Monoglycerides
- Protein
  - Amino acids
Absorption of All Nutrients

- **Macronutrients**
- **Micronutrients** – nutrient molecules so small that no digestion is required before being absorbed
  - Vitamins
  - Minerals
  - Water
Elimination of Wastes

- **Food**
- **Chyme**
- **Feces** – waste product from animal's digestive tract expelled through the anus during **defecation**
  - Water (75%)
  - Bacteria
  - Fiber
  - Undigested/unabsorbed nutrients
  - Waste products
Comparative A&P

Herbivores
Carnivores
Omnivores
Species Variation

- Requirements for digestion and absorption of foodstuffs vary depending on diet of animal:
  - **Herbivores** – plant-eating animals (cattle, sheep, goats)
  - **Carnivores** – meat-eating animals (cats)
  - **Omnivores** – animals that eat plant material and meat
- **Monogastric** animals – simple, single stomachs
- **Ruminants** – multiple mixing and fermentation compartments in addition to stomach
Herbivores
Carnivores
Omnivores
Anatomy of GIT

Trace a Bolus of Food from the Oral Cavity to the Anus
3 Tracts Exiting Body
Trace a Bolus of Food

Figure 11-1, Page 265
• **Mucosa** – lining of GI tract; epithelium and loose connective tissue
• **Submucosa** – dense connective tissue; may contain glands
• **Muscle layer** – outside the submucosa
• **Serosa** – outermost layer; thin, tough connective tissue.
Mesentery

- Sheets of connective tissue
- Suspend digestive tube in abdomen from dorsal body wall
- Contains blood and lymph vessels and nerves that supply GI tract
Mouth

Oral cavity

Buccal cavity
Mouth (Oral Cavity)

- Lips
- Salivary glands
- Tongue
- Teeth
- Hard palate
- Soft palate
Salivary Glands

- **Exocrine** glands
- Produce saliva; usually three pairs with ducts that carry the saliva to the oral cavity
  - **Parotid** salivary glands – ventral to the ear canals
  - **Mandibular** salivary glands – ventral to the parotid glands at the caudal angle of the mandible
  - **Sublingual** salivary glands – medial to the shafts of the mandible just under the base of the tongue
Oral Cavity Functions

- Lips may play role in *prehension*
- Initiate **mastication** *(mechanical digestion)*
  - Breaks food into smaller particles that increase the surface area available for exposure to the enzymes involved in chemical digestion
- Initiate **chemical digestion**
  - **Saliva** – added to food as it is chewed; moistens, softens, and shapes food into a form that is more readily swallowed
  - **Salivary amylase**
Comparative Anatomy

- Zygomatic (dorsal buccal) gl
- Parotid gl
- Mandibular gl
- Ventral buccal gls
- Polystomatic sublingual gls
- Rostral part of monostomatic sublingual gl
- Caudal part of monostomatic sublingual gl
- Dorsal buccal gl
- Ventral buccal gl
- Polystomatic sublingual gl
- Mandibular gl
• Tongue has 4 types of taste buds
Epiglottis
Root of tongue
Palatine tonsil
Lingual tonsil
Circumvallate papilla
Filiform papilla
Body of tongue
Fungiform papilla

TASTE ZONES:
Bitter
Sour
Salty
Sweet
Teeth

• **Mastication** – chewing; physically break down food into smaller pieces

• **Upper arcade** – contained in **maxilla** and incisive bones

• **Lower arcade** – contained in **mandible**
Teeth Shape

Figure 11-4, Page 268

- **Carnivore teeth** – more pointed on their occlusal surface; slightly curved toward back of mouth
  - Good for holding prey, tearing, cutting, shredding
- **Herbivore teeth** have flat occlusal surfaces
  - Good for grinding plant and grain material
Types of Teeth

- Incisors
- Canines
- Premolars
- Molars
Types of Teeth
Figure 11-5, Page 268
Tooth Terminology

- **Lingual** – inner surface of the lower arcade of teeth
- **Palatal** – inner surface of the upper arcade
- **Labial** – outer surface of the upper and lower arcade at the front of the mouth
- **Buccal** – outer surface of the teeth more caudal in the mouth
Maxilla & Mandible

• Tooth Surfaces
  ▪ Lingual
  ▪ Palatal
  ▪ Labial
  ▪ Buccal
Dental Formula

- Represents the typical number of each type of tooth found in the upper and lower arcade.
- Tooth type designated \( I \) for incisor, \( C \) for canine, \( P \) for premolar, and \( M \) for molar.
  - **Upper case** for adult teeth
  - **Lower case** for deciduous teeth
Dental Formula

• Tooth type followed by two numbers separated by a slash mark or expressed as a fraction of one number over the other
  ▪ First number – number of teeth in *half* of the upper arcade
  ▪ Second number – number of teeth in *half* of the lower arcade
• Total number determined by summing all the numbers and *multiplying by 2*
**Example: Adult Dog**
- The dental formula is $I^3_3 C^1_1 P^4_4 M^2_3$ or $3\frac{3}{4} 4\frac{4}{3}$. The slash mark separates the upper arcade number from the lower arcade number.
- Add the numbers together:
  - $3 + 3 + 1 + 1 + 4 + 4 + 2 + 3 = 21$ teeth, representing half of the total number.
- Multiply the number by 2:
  - $21 \times 2 = 42$ total teeth in the adult dog's mouth.

### Dental Formulas for Several Domestic Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Dental Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canine—puppy</td>
<td>$i_3^3 c_1^1 p_3^3 \frac{3}{328}$</td>
</tr>
<tr>
<td>Canine—adult</td>
<td>$I_3^3 C_1^1 P_4^4 M_3^2$</td>
</tr>
<tr>
<td>Feline—kitten</td>
<td>$i_3^3 c_1^1 p_3^3$</td>
</tr>
<tr>
<td>Feline—adult</td>
<td>$I_3^3 C_1^1 P_2^2 M_3^1$</td>
</tr>
<tr>
<td>Equine—adult</td>
<td>$I_3^3 C_1^1 P_3^3 M_3$</td>
</tr>
<tr>
<td>Porcine—adult</td>
<td>$I_3^3 C_1^1 P_4^4 M_3^2$</td>
</tr>
<tr>
<td>Bovine—adult</td>
<td>$I_3^3 C_1^1 P_3^3 M_3$</td>
</tr>
</tbody>
</table>
Canine Dental Formula

Dental formula: \( \left( \frac{1}{3} \right) \left( \frac{3}{1} \right) \left( \frac{4}{4} \right) \left( \frac{2}{3} \right) \times 2 = 42 \)
Feline Dental Formula

Dental formula: \((I^3 \quad C_1 \quad PM_3 \quad M_1) \times 2 = 30\)
Comparative Anatomy
Dog & Cat
Comparative Anatomy – Ruminants

- **Ruminants** have no upper incisors or upper canine teeth
  - Dental pad – flat thick connective-tissue structure on the maxilla opposite the lower incisors and canine teeth
Horse Teeth
Comparative Anatomy
Bird Beak
Structure of Teeth

Figure 11-6, Page 269

- **Crown**
  - Enamel
  - Dentin
  - Pulp
- **Gingiva**
- **Root**
  - Dentin
  - Pulp
  - Cementum
  - Periodontal ligament
Dental Care

• Clinical Application –
  ▪ Page 270
Needs a Dentist?
Dental Pathology
Equine; Canine

Point

Retained baby canine tooth
The brown substance (calculus) is laden with bacteria which cause permanent damage to the gums.
Dental Procedure
Into the Abdomen

- Stomach
- Duodenum
- Jejunum
- Small intestine
- Caecum
- Colon
  - Transverse
  - Ascending
  - Descending
- Rectum
- Anal canal
Fun Comparative Anatomy! 😊
Esophagus & Stomach

Food Becomes *Chyme*
Esophagus

- Transports swallowed material from pharynx to stomach
- Enters the stomach at an angle in cardia region
  - Surrounded by cardiac sphincter muscle
- As stomach expands, fold of the stomach against esophagus closes the lower end of esophagus
  - Reduces the risk for reflux
  - In some species, the closure is strong enough to prevent reflux or vomiting (horse, rabbit)
• Five different areas
  1. Cardia
  2. Fundus
  3. Body
  4. Pyloric antrum
  5. Pyloris
Monogastric Stomach

- **Cardia** – opening from the esophagus
- **Fundus** – distensible blind pouch; expands as more food is swallowed
- **Body** – distensible middle section
  - Fundus and body contain numerous glands
  - Gastric glands contain:
    - Parietal cells – produce **hydrochloric acid**
    - Chief cells – produce the enzyme **pepsinogen**
    - Mucous cells – produce the protective **mucus**
Monogastric Stomach

- **Pyloric antrum** – grinds up swallowed food; regulates hydrochloric acid
  - Glands contain G cells - secrete gastrin
- **Pylorus** – muscular sphincter; regulates the movement of *chyme* from the stomach into the duodenum
  - Prevents backflow of duodenal contents into the stomach
Esophagus & Stomach

- **Esophagus**
  - Food bolus
  - Peristalsis
- **Stomach**
  - Mucosal lining (Rugae)
  - Mechanical digestion
  - Chemical digestion
    - HCl
    - Protease (pepsin)
  - Pylorus (pyloric valve)
Rugae Have Ridges! 😊
Stomach Anatomy

(From Tama T: Small animal endoscopy, ed 2, St Louis, 1990, Mosby.)
1. A mixing wave initiated in the body of the stomach progresses toward the pyloric sphincter (pink arrows directed inward).

2. The more fluid part of the chyme is pushed toward the pyloric sphincter (blue arrows), whereas the more solid center of the chyme squeezes past the peristaltic constriction back toward the body of the stomach (orange arrow).

3. Peristaltic waves (purple arrows) move in the same direction and in the same way as the mixing waves but are stronger.

4. Again, the more fluid part of the chyme is pushed toward the pyloric region (blue arrows), whereas the more solid center of the chyme squeezes past the peristaltic constriction back toward the body of the stomach (orange arrow).

5. Peristaltic contractions force a few milliliters of the most fluid chyme through the pyloric opening into the duodenum (small red arrows). Most of the chyme, including the more solid portion, is forced back toward the body of the stomach for further mixing (yellow arrow).
Gastric Motility

- Each area of the stomach has different motor functions.
  - Fundus and body relax with swallowing of food
  - Body of the stomach contracts to help mix food
  - Pyloric antrum increases contractions in response to swallowing; stimulates mixing, grinding, and propulsive contractions that move food toward the pylorus
- Peristalsis also occurs in stomach and intestines
Gastric Secretions

- **Pepsinogen** - secreted by chief cells; precursor for the enzyme pepsin
  - Breaks proteins into chains of amino acids
- **Hydrochloric acid (HCl)**
  - Hydrogen (H\(^+\)) and chloride (Cl\(^-\)) ions - secreted by parietal cells in the gastric glands
  - Combine in the stomach to produce hydrochloric acid
- **Mucous** – produced by goblet cells in gastric glands; main constituent of the mucous coating
Comparative Anatomy
Ruminant Stomach

Reticulum
Rumen
Omasum
Abomasum
Figure 10-11  A, View from the left side of a cow showing the anatomical positions of the organs of the thorax and abdomen in situ.
Ruminant Stomach

Figures 11-8 & 11-9, Page 274

- Reticulum
- Rumen
- Omasum
- Abomasum
Ruminant Digestive Tract
TOPOGRAPHY OF RIGHT SIDE OF ABDOMEN OF A FIVE-YEAR-OLD NON-PREGNANT COW
Topography of left side of abdomen of 9-month-old non-pregnant heifer
HUGE Bovine Stomach! 😊
Ruminants
Figure 11-8, Page 274

• One true stomach and three forestomachs
• Ruminants swallow their food, regurgitate it to chew on it some more before swallowing it again (rumination)
Ruminants

- **Abomasum** – true stomach
- Forestomachs
  - **Reticulum**
  - **Rumen**
  - **Omasum**
Fluid/Gas Lines

- Small intestine
- GAS
- LIQUID
- Rumen
- Esophagus
- Omasum
- Reticulum
- Abomasum
Fluid/Gas Lines

- Gases
- Today's hay
- Grain and yesterday's hay
Reticulum

- **Smallest, most cranial** compartment of the forestomach compartments
- Lining composed of **honeycomb** arrangement of folds
- **Hardware disease**
- Reticulum and rumen – coordinated contractions
Reticulum
Rumen

• **Series of muscular sacs** partially separated from one another by long muscular folds of rumen wall called pillars
  ▪ Pillars aid in mixing and stirring of ruminal contents

• Reticuloruminal contractions
  ▪ Allow partially digested plant food to be **regurgitated**
  ▪ Allow built-up **carbon dioxide or methane gas** to be expelled from the rumen
Physiology of Rumination

- **Rumination** – “chewing cud”
  - Regurgitation
  - Resalivation
  - Reswallowing of food
- **Eructation** – CO$_2$ or CH$_4$ gas from rumen
- Bacteria & protozoa digest **cellulose (plant fiber)**
Omasum and Abomasum

- **Omasum** – muscular organ with many muscular folds
- Breaks food particles down further
- **Abomasum** – true stomach
  - Functions much the same as monogastric stomach
  - On **left side**, just like **monogastric stomach**
Small Intestine

Duodenum
Jejunum
Ileum
Small Intestine
Small Intestine

- **Duodenum** – first short segment that leaves the stomach
- **Jejunum** – longest portion
- **Ileum** – separated from colon by ileocecal sphincter; regulates movement of materials from the small intestine into the colon or the cecum
Jejunum
Small Intestine Mucosa
Figure 11-10, Page 277

- **Mucosa** – many folds and **villi**
- Each villus contains thousands of **microvilli (brush border)**
- Microvilli – digestive enzymes and carrier molecules embedded in cell membranes
Microvilli
Epithelial cell
Capillary (blood)
Lacteal (lymph)
Epithelial cell
Villus
Small Intestine Digestion

- **Electrolytes, water, and vitamins** – absorbed intact across the small intestine wall
  - Micronutrients
- **Carbohydrates, proteins, and fats** – chemically digested
  - Macronutrients
Digestion of Macronutrients

- Food
  - Carbohydrate
    - Monosaccharides
  - Lipid
    - Fatty acids
    - Monoglycerides
  - Protein
    - Amino acids
Carbohydrate Digestion

- **Starch** converted into disaccharides into lumen of the duodenum by **pancreatic amylase**
- Disaccharides further digested by enzymes in microvilli cell membranes
- Resulting **monosaccharides** transported across the microvilli cell membrane and **absorbed into the blood**
Protein Digestion

- Gastric pepsin breaks apart some protein chains into smaller polypeptides
- Five **pancreatic proteases**: trypsin, chymotrypsin, elastase, aminopeptidase, and carboxypeptidase
- **Amino acids**, dipeptides, and some tripeptides are then absorbed across the cell membrane
Fat Digestion

- **Bile acids** coat the fat droplets in duodenum
- **Pancreatic lipases** penetrate bile acid coating
  - Digest fat molecules to produce glycerol, **fatty acids**, and monoglycerides
Large Intestine
Chyme Becomes Feces

Cecum
Colon
Rectum
Large Intestine

- Cecum
- Colon
  - Ascending
  - Transverse
  - Descending
- Rectum
Large Intestine

• Components
  ▪ **Cecum** – blind sac at ileocecal junction
  ▪ **Colon** – some microbial digestion
  ▪ **Rectum**

• **Species variation** in structure

• Primary functions
  ▪ **Recover fluid and electrolytes**
  ▪ **Store feces** until they can be eliminated
Colon on X-ray
• **Carnivores**: simple, tubular colon; poorly developed cecum

• **Nonruminant herbivores**: very large colon and cecum (hindgut)
  - Fermentation site
Comparative Anatomy – Ascending Colon

Figure 11-11, Page 280

- Equine – large colon
- Bovine – coiled colon
- Porcine – spiral colon
Equine Colon – Complex!
Equine Colon
Porcine Ascending Colon – Spiral!
• **Carnivores**: simple, tubular colon; poorly developed cecum

• **Nonruminant herbivores**: very large colon and cecum (hindgut)
  - Fermentation site
Hindgut Digestion

- Equine, guinea pigs, rats, rabbits
- Modifications of cecum and colon allow fermentative digestion in hindgut similar to rumen
Rectum

- Terminal portion of large intestine
- Nervous system control of motility and secretions is similar to that of the colon
- Numerous mucus-secreting glands lubricate and aid the passage of contents
- Sensory receptors detect stretching and stimulates the defecation response
Anus

- Composed of internal and external muscular sphincters
  - Internal sphincter is under autonomic control
  - External sphincter that is under voluntary control
- As the rectum distends, stretch receptors in rectum wall cause partial relaxation of the internal sphincter
- Anal mucosal receptors increase the sense or need for defecation
Accessory Organs

Liver
Pancreas
Related Organs

- **Liver**
  - Gall bladder
  - Common bile duct

- **Pancreas**
  - **Exocrine** functions
    - Pancreatic duct
  - **Endocrine** functions
    - Insulin
    - Glucagon
Location of Liver

Bassert Lab Manual – Page 284
Functions of Liver

- Produces **bile** – bile acids, cholesterol, bilirubin
  - Secreted into bile ducts, on to hepatic duct, then to gallbladder for storage
- **Removes toxins**, infectious agents, and so forth that enter the body through the wall of the GI tract
- **Stores or metabolizes nutrients** absorbed from the GI tract
  - **Glucose → Glycogen**
Other Functions of Liver

<table>
<thead>
<tr>
<th>Function</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>Digestion</td>
<td>Bile neutralizes stomach acid and emulsifies fats, which facilitates fat digestion</td>
</tr>
<tr>
<td>Excretion</td>
<td>Bile contains excretory products such as cholesterol, fats, and bile pigments, such as bilirubin, that result from hemoglobin breakdown</td>
</tr>
<tr>
<td>Nutrient storage</td>
<td>Liver cells remove sugar from the blood and store it in the form of glycogen; also store fat, vitamins (A, B\textsubscript{12}, D, E, and K), copper, and iron</td>
</tr>
<tr>
<td>Nutrient conversion</td>
<td>Liver cells convert some nutrients into others, for example, amino acids can be converted to lipids or glucose; fats can be converted to phospholipids; vitamin D is converted to its active form</td>
</tr>
<tr>
<td>Detoxification of harmful chemicals</td>
<td>Liver cells remove ammonia from the circulation and convert it to urea, which is eliminated in the urine; other substances are detoxified and secreted in the bile or excreted in the urine</td>
</tr>
<tr>
<td>Synthesis of new molecules</td>
<td>Synthesizes blood proteins such as albumin, fibrinogen, globulins, and clotting factors</td>
</tr>
</tbody>
</table>
Location of Pancreas
Liver, Pancreas, & Ducts

1. The hepatic ducts from the liver lobes combine to form the common hepatic duct.

2. The common hepatic duct combines with the cystic duct from the gallbladder to form the common bile duct.

3. The common bile duct joins the pancreatic duct.

4. The combined duct empties into the duodenum at the duodenal papilla.

5. Pancreatic secretions may also enter the duodenum through an accessory pancreatic duct, which also empties into the duodenum.
Pancreatic & Common Bile Ducts

Bassert Lab Manual – Page 285

Diagram showing the anatomy of the pancreas and common bile ducts.

- Gallbladder
- Cystic duct
- Hepatic ducts
- Duodenum
- Main pancreatic duct
- Vater’s ampulla
- Common bile duct
- Accessory pancreatic duct
- Pancreas
  - Tail
  - Head
Functions of Pancreas

- Only gland in body with both exocrine and endocrine functions!!!
- Production of pancreatic amylase, proteases, and lipase
- Secretes bicarbonate into the duodenum
  - Helps neutralize acidity of contents and maintains the pH in the duodenum needed for proper enzyme function
- Produces insulin and glucagon
  - Help regulate blood glucose levels
GIT Physiology

Lots going on! 😊
Swallowing

- Hard palate
- Nasal cavity
- Oral cavity
- Eustachian tube
- Soft palate
- Epiglottis
- Oesophagus
- Larynx and trachea
Breathing
Peristalsis
Figure 11-3A, Page 267

- Circular muscle contractions
- Wavelike movement along the tract
- **Propel** digestive tract contents along the tube ahead of them
Peristalsis

1. A wave of circular smooth muscle relaxation moves ahead of the bolus, allowing the digestive tract to expand.

2. A wave of contraction of the circular smooth muscles behind the bolus propels it through the digestive tract.
Peristalsis
Segmental Contractions

Figure 11-3B, Page 267

- Periodic circular muscle contractions
- Occur in different adjacent sites
- Mixes digestive tract contents and slows their movement through GIT
Physiology of Digestion

- **Carbohydrate**: Monosaccharides
- **Lipid**: Fatty acids, Monoglycerides
- **Protein**: Amino acids
Pancreatic Digestive Enzymes

- **Amylase** – enzyme in saliva of omnivores
  - Breaks down amylose (sugar component of starch)
- **Lipase** – enzyme that digests lipids
  - May be found in the saliva of some young animals while they are nursing or on a high-milk diet
- **Protease** – enzyme that digests proteins
Nervous System & Digestion

- **Autonomic** nervous system controls most of the glands in the digestive system.

- **Parasympathetic** stimulation increases salivation.
  - Anticipation of eating can cause parasympathetic stimulation of the salivary glands.

- **Sympathetic** nervous system stimulation decreases salivation.
  - Fear or parasympathetic nervous system inhibitors like atropine produce dry mouth.
Ingestion (2 L)

Salivary gland secretions (1 L)

Gastric secretions (2 L)

Pancreatic secretions (1.2 L)

Bile (0.7 L)

Small intestine secretions (2 L)

92% absorbed in the small intestine

6 - 7% absorbed in the large intestine

1% in feces

(Water in feces = ingested + secreted - absorbed)
GIT Review – Trace a Bolus of Food

- Stomach
- Duodenum
- Jejunum
- Ileum
- Small intestine
- Caecum
- Colon
- Transverse
- Descending
- Rectum
- Anal canal
## Parasites of GIT

<table>
<thead>
<tr>
<th>Parasite</th>
<th>Location</th>
<th>Who?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundworms</td>
<td>S.I.</td>
<td>Puppies, Kittens</td>
</tr>
<tr>
<td>Hookworms</td>
<td>S.I.</td>
<td>Dogs, Cats</td>
</tr>
<tr>
<td>Whipworms</td>
<td>L.I.</td>
<td>Dogs</td>
</tr>
<tr>
<td>Tapeworms</td>
<td>S.I.</td>
<td>Dogs, Cats</td>
</tr>
<tr>
<td>Coccidia</td>
<td>S.I.</td>
<td>Puppies, Kittens</td>
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</tbody>
</table>
Small Animal GIT Pathology

- Stomatitis
- Glossitis
- Gingivitis
- Periodontitis
- Dental caries
- Pharyngitis
- Gastritis
- Gastroenteritis
- Enteritis
- Colitis
Small Animal GIT Pathology

- Prostaglandins & NSAIDS (Page 247)
- Canine gastric bloat
- Gastric torsion
- Hepatitis
  - Jaundice (icterus)
- Pancreatitis
- Diabetes mellitus
- Coprophagy
- Lactose intolerance
No Gall Bladder

• Horse
• Rat

• Terms to also know – stomatitis, glossitis, tenesmus, prehension, mastication, anorexia, laparotomy, enterotomy, colotomy, anastomosis, rumenotomy, abomasopexy, gastropexy, intussusception, etc.
Large Animal GIT Pathology

- Bovine bloat (rumen)
- Displaced abomasum (DA)
- Equine Colic
Test Yourself
KNOW THESE IN EVERY CHAPTER!

Pages 270, 273, 277, 279, 282