Digestive System

A. 2 parts

1. Gastrointestinal (GI) Tract

A)

2. Accessory Structures

A)

B. 6 basic processes

1. Ingestion

2. Secretion

3. Propulsion

4. Digestion (catabolism)

A)

1) Chewing, mixing with tongue, churning in stomach, segmentation in small

intestine, and haustral churning in large intestine

B)

1) Breakdown by enzymes

5. Absorption

6. Defecation

C. Anatomy of the Digestive System

1. Oral cavity (mouth)

A) Oral orifice –

B) Lips & cheeks

1) Make up anterior and lateral walls of oral cavity

2) Composed of a core of

3) Lined with

4) Aid in chewing, keeping food within oral cavity, and speech

C) Palate

1) Forms superior aspect of the oral cavity (roof of mouth)

2) 2 distinct portions

a) Hard palate –

i) Composed of the

ii) Tongue forces food against it during chewing

b) Soft palate –

i) Soft, mobile flap that raises to block the nasopharynx during swallowing

ii) Composed of a core of

iii) – finger-like projection of the soft palate; function unclear

D) Tongue

1) Makes up inferior aspect of oral cavity

2) Moves food around during mastication (chewing) and swallowing

3) Essential for speech production

4) Contains – receptors for various food taste sensations

5) – connect tongue to floor of mouth

6) – small elevations on surface of tongue

a) Aid in handling of food in mouth

b) Contain

c) 3 types of papillae

i) – cone-shaped

(a)

(b) Sensitive to

ii) – mushroom-shaped

(a) Taste buds located on of the papillae

iii) – resemble fungiform but larger with

surrounding furrow

(a) Taste buds located on the of the papillae

2. Salivary glands – produce saliva

A) Intrinsic salivary glands –

1) Scattered within mucosa of tongue, palate, lips & cheeks

2) Secrete saliva to

B) Extrinsic salivary glands –

1) Lie external to oral cavity & secrete saliva into ducts leading to mouth

2) Only secrete saliva as we eat;

3) 3 types

a) – lies slightly anterior & inferior to the ear

b) – on medial surface of mandible, just anterior to

mandibular angle

c) – floor of mouth just inferior to tongue

3. Teeth

A) 2 categories

1) Deciduous (baby teeth) –

a) Lost between ages of

2) Permanent – (including 3rd molars – wisdom teeth)

B) 4 types

1) – chisel-shaped

2) – cone-shaped

3) – broad crown (top) with two rounded cusps

(bumps)

4) – broad crown & four rounded cusps

C)

D) Tooth structure

1)

a) Portion above gum (gingiva)

b) Covered in

2)

a) Embedded in jaw

b) Covered by – calcified connective tissue

i) Attaches tooth to the – connects tooth to

jaw

3)

a) Narrowed region between crown & root

4)

a) ; makes up majority of the tooth

5)

a) Located within the dentin; houses

6)

a) Extends from pulp cavity to proximal end of tooth; passageway for blood

vessels & nerves

7)

a) Opening at the proximal end of the tooth; allows blood vessels & nerves to

enter and leave the tooth

4. Pharynx

A) Passageway from mouth to esophagus; smooth muscles within propel food towards

the esophagus

B) Oropharynx – portion connected to oral cavity

C) Laryngopharynx – portion connected to larynx & esophagus

5. Esophagus

A) Passageway for food from

B) Associated structures

1) – passageway through the diaphragm

2) – opening between esophagus and stomach

3) – muscle that closes off to prevent backflow from

stomach into esophagus

C) Lined with

6. Stomach

A) Lined with

B) Regions

1) – encircles the cardiac orifice at junction w/ esophagus

2) – dome-shaped, tucked under diaphragm

3) – large mid-portion of stomach

4) – terminal region of stomach

a) – controls entry of chyme (food) into S.I.

C) – longitudinal folds in the mucosa

D) Within the wall are a large number of

1) Produce

2) Contain 4 cells types

a) cells – produce an acidic mucus unique to the stomach

b) cells – produce HCl-

c) cells – produce pepsinogen (inactive form of pepsin)

d) cells – produces gastrin

i) Released when

ii) Stimulates the secretion of

7. Small intestine

A) Longest part of tubular gut (6-7 meters relaxed, 2-4 meters normally)

B) Possess – finger-like projections of the mucosa

1) Contain

C) Lined with epithelium; ciliated with goblet cells

1) Possess – finger-like projection of the columnar cells

D) 3 segments

1)

a) Receives pancreatic enzymes via the  *,* bile via the

and from the pyloric region of the stomach

2)

3)

a) Empties into the (large intestine)

8. Large intestine

A) Lined with epithelium; ciliated with goblet cells

B) Subdivisions

1) – sac-like portion inferior to ileocecal valve

a) – located at junction of ileum and cecum;

control movement of chyme into L.I.

2) Colon – composed of sac-like pockets known as

a) colon – moves upward along right posterior abdominal wall

up to kidney

b) colon – extends to the left across abdominal cavity

c) colon – moves downward along left posterior abdominal wall

d) colon – S-shaped terminal end of colon

3) – passageway from sigmoid colon to anal canal (anus)

a) (anus) – terminal portion of L.I.

i) Opens to outside of body

(a) Internal anal sphincter –

(b) External anal sphincter –

9. Liver

A)

B) Produces – green, alkaline (basic) liquid stored in the gallbladder

1) Partially a digestive product & partially an excretory product

a) – necessary for lipid digestion & absorption

b) – created by the breakdown of RBC

C) 2 surfaces

1) Diaphragmatic (anterior) – divided into 2 lobes by the

a)

b)

2) Visceral (posterior)

a)

b)

D) – carries oxygenated blood from heart to liver

E) – carries deoxygenated blood from liver to heart

F) – carries blood from stomach & intestines to liver

G) – carry bile

1) Right – from

2) Left – from

3) Common hepatic – created by a merging of the

10. Gallbladder

A) Small (~ 4 inches) sac located on the

B) Lined with epithelium

C) Stores & concentrates

D) – carries bile to & from gallbladder

1) Merges with common hepatic duct to form the

2) – carries bile to duodenum

11. Pancreas

A) Endocrine & exocrine organ

B)

1) Consists of a

C) Produces

1) Many of the enzymes used by the S.I. for digestion

2) Produced by the

a) – clusters of aciner cells

D) duct – lies at head on pancreas and

merges with main pancreatic duct

E) duct – merges with bile duct and empties into

the duodenum

1) Release of bile & pancreatic juice controlled by

D. Digestion & Absorption

1. Mouth

A) Mechanical digestion

1)

B) Chemical digestion

1)

a) Starts breakdown of starch

2)

a) Starts breakdown of dietary triglycerides

C) Normally

D) Swallowing

1) 3 phases

a) Voluntary phase

b) Pharyngeal phase

c) Esophageal phase

2. Esophagus

A) Enzymes from the mouth are still working

B) Secretes no enzymes only

C)

D)

1) Wave-like, smooth muscle contractions that move foodstuffs through the GI tract

3. Stomach

A) Mechanical digestion

1) (smooth muscle contractions) mixes bolus with gastric juices

yielding

B) Chemical digestion

1)

a) Inactivates salivary amylase & lingual lipase

b) Initiates protein catabolism by

2)

a) Produced when HCl- activates

b) Begins breakdown of

C) Very little absorption

1) Water, ions, aspirin, and alcohol

D) Releases chyme into S.I. in small amounts over a period of time (~4 hours)

4. Small Intestine

A) Mechanical digestion

1) Peristalsis

2)

a) Oscillating, ring-like, smooth muscle contractions

i) Mixes chyme with digestive juices

ii) Brings digestive products into contact with mucosa helping absorption

B) Chemical digestion

1) CHO catabolism – desirable end product is glucose in all cases (however,

sometimes the end product is fructose or galactose)

a) Brush border enzymes (released from the small intestine itself)

i)

ii)

iii)

iv)

v)

b) Pancreatic enzymes

i)

2) Protein catabolism – desirable end product is a single amino acid

a) Brush border enzymes

i)

ii)

iii)

b) Pancreatic enzymes

i)

ii)

3) Lipid catabolism – desirable end products are 2 fatty acids & 1 monoglyceride

or 3 fatty acids and 1 glycerol

a)

i) Emulsification

b) Pancreatic lipase

B) Absorption – about 90% of all absorption occurs here

1) CHO absorption (monosaccharides; glucose, fructose, galactose)

a) Fructose

i)

b) Glucose & galactose

i)

2) Protein absorption (individual amino acids)

a)

3) Lipid absorption (monoglycerides & fatty acids)

a)

i) Bile salts & lecithin bind with fatty acids & monoglycerides forming small

clusters known as

(a) Micelles are absorbed into the columnar cells where

ii) Triglycerides are coated with phospholipids & cholesterol resulting in

iii) Chylomicrons are then absorbed into the

C) Chyme may spend up to 4 hours in the small intestine

5. Pancreas

A) Accessory to the S.I.

B) Produces:

1)

a) Buffers the acidic chyme coming from the stomach

i) Stops the action of

2)

a) Work in small intestine

6. Liver

A) Accessory to the S.I.

B) Many functions

1)

2) Removal of

3) vitamin storage

4) Produces & stores

5) Phagocytosis of

a) Results in the production of

6) Synthesis of

7) Produces

a) Yellow-green, alkaline solution containing bile salts, bilirubin, cholesterol,

lecithin & and a number of electrolytes

b) Involved with lipid catabolism & absorption

7. Gallbladder

A) by absorbing water & ions

B) Releases bile into S.I. in response to the release of

1) Released from intestinal lining in response to

8. Large Intestine

A) Digestion

1) Mechanical digestion

a) Peristalsis at a slow rate

b)

i) Contraction of an individual haustrum

c)

i) Strong wave beginning in transverse colon and pushing contents into

rectum

2) Chemical digestion

a)

b) living in the L.I. finish digestion

i) Ferment CHO – provide themselves with energy

ii) Some B vitamins & vitamin K are end products of bacterial action

B) Absorption

1)

2)

3)

C) Chyme may remain in the large intestine for 3-10 hours

D) Defecation

1) reflex initiated when feces enters the rectum

2) Impulses travel back to

a) Internal anal sphincter relaxes allowing feces into the

3) Cerebral cortex fires causing external anal sphincter to relax and the rectal

muscles to contract

E. Disorders of the Digestive System

1. Peritonitis – inflammation of the peritoneum

2. Mumps – swollen parotid glands as a result of a virus (Myxovirus)

3. Heartburn – failure of the cardiac sphincter to remain closed

4. Hiatal hernia – upper portion of the stomach protrudes above the diaphragm

5. Gastric (or Peptic) ulcers – erosion of the stomach (or small intestine) wall associated

with the *Helicobacter* bacteria

6. Enteritis – inflammation of either intestine; however usually the small intestine

7. Hepatitis – inflammation of the liver as a result of a viral infection (A-E, G)

8. Cirrhosis – chronic inflammation of the liver due to alcoholism or hepatitis

9. Gallstones – highly concentrated cholesterol derivatives in bile

10. Jaundice – accumulation of bilirubin in the skin as a result of a blockage or liver

disease resulting in a yellow skin color