Gastrointestinal system

02 April 2017 21:14

Function
Regulate intake of food and h2o - partly by gut appetite, thirst
Conversion food -> nutrients - struft of gut - break - components absorbed across gut wall
Absorptions of nutrients & h2o - across gut wall, > circulation
Excretion of waste products - substances don't want - out body - bile - GI tract, feaces
Protect against back & toxins - stomach 1st line defence

Processes:
- Sensory inputs: appeptitie, taste, smell, sight - from food in GI tract & b4 eat
- Mechanical & chem breakdown food -> smaller pieces - reab. Across gut
- Secretion, absorption & excretion - across lining GI tract
- Regulation by nerves hormones (by ANS, by GI tract) & local factors (reflexes)

Enteric Nervous System
- Subdivision of ANS
- Self-contained NS
  - Autonomic nerves w/in gut, w/ ganglia (collection nerve cell bodies) @ myenteric & submucosal plexus
  - Control smooth musc contraction & excocrine/endocrine gland secretions
  - Regulated by symp & para nerves & sensory reflexes - baroreceptors - feedback using stretch -> enteric NS - can signal to symp & para
  - Sensory reflexes - higher p.ways - send signal up about appetite - if distended/not
  - Symp & para have synapses onto enteric NS - can switch nerves on/off to req. funct.

Myenteric plexus - control smooth muscle - nerve cell bodies in musc. Externa
Submucosal plexus - nerve cell bod - nerves control secretion from submucosa -> lumen of GI tract

Control gut motility
- Intestinal cells of Cajal (pace-setter cells) - can depolarize -> change mem potent & spont. Release into smooth muscle cells next to it, smooth muscle cells joined by gap junctions, muscle will spread to all connected
- Specialised smooth muscle cells
- Pace maker activity
- Det. Freq. of slow waves of gut, can spasm - as Irritable bowel syndrome if cells abnormal

Stim para NS - vols NS - sets -> interstitial cells of Cajal (pace-setter cells)
Pace setter cells give: small dep. - can cause muscle contraction if exceed threshold, increase stim increase contrac increase no. AP
If get up to threshold for AP - spike pot. Electrodes in smooth muscle of GI - muscularis externa

Circulation of GI system
- Collectively called splanchnic circulation
- Contains 15% total blood vol - can divert blood away from gut in emergency - blood flow increase when eating, decrease when exercising
- Transports absorbed nut & waste prod for excretion
- Portal circulation (small intestine -> liver) bet GI tract & liver
- Adjustable resistance & reservoir of blood
- Vasodilation by parasymp control
- Vasoconst by symp

Liver
Detoxify bad bact and toxins from gut b4 enter vena cava
In drug design need make sure can pass liver

Structure of Oral Cavity
Initial stages of digestion
- Mechanical b/own food - teeth, tongue, muscles - jaw - form bolus (small food parcel) to be broken down
- Chew b/own food: amylase (breakdown carbs) and lipase (breakdown fats to trigly) in saliva
- Swallowing reflex to move bolus -> pharynx and oesophagus - voluntary w/ skeletal musc

Sensory input from food - provide cephalic phase
- Chem stim of olfactory receptors in nose and taste buds in tongue

Food and air pass at pharynx - food then to oesophagus

Accessory Organs of Digestive Tract
- Salivary glands
- Liver
- Gallbladder - bile store
- Pancreas - make enz. To digest

Muscosa layer - in contact w/ food
- Mucosa epithelium - single layer epithelium
- Lamina propria - loose conn. Tiss. - blood vess, cap, nerves, lymphatic vess - take up nutrients
- Muscularis mucosa - smooth musc. Around outside-contact & change SA

Submucosa
- Loos conn. Tiss.
- Exocrine glands - make enz. Fluid (alkaline) - empty -> lumen, substances go out of body
- Nerves, blood and lymph vessels

Muscularis propria
- Inner circular smooth muscle
- Outer longitudinal smooth muscle - imp to mix food, contract- allows move down length GI tract
2 layers in most parts GI tract

Serosa
- Outer conn tiss - fibrous, hold everything tog, anchor gut to abdo wall

Lumen
- Where food is

Structure- Major subdivisions of digestive tract
1. Oral cavity, teeth, tongue - mechanical processing, some chem. Breakdown, moistening, mixing with salivary secret.
2. Pharynx - muscular propulsion of mat -> oesophagus
3. Oesophagus - transp mat -> stomach - deliver bolus food down
4. Stomach - chem b.own mat via acid &enz., mech processing through muscular contractions
5. Small intestine - enz digest & absorp. H2o, organic substances, vit & ions - duodenum, ilium, jejunum
6. Large intestine - dehydration and compaction of indigestible mat in prep for elimination -ecum, colon

Processes:
- Sensory input from food - appeptitie, taste, smell, sight - from food in GI tract & b4 eat
- Mechanical & chem breakdown food -> smaller pieces - reab. Across gut
- Secretion, absorption & excretion - across lining GI tract
- Sensory inputs: appeptitie, taste, smell, sight, - on GI tract & b4 eat

Phases of Digestion
Relates to where food is in GI tract
Control digestive processes - gut motility and secretions

Cephalic - if cut vagus nerve doesn't happen
- Anticipation of feeding - feed forward
- Sensory input from food - thought, sight, smell, taste
- Mediated by vagal parasymp nerves - gut motility & secretions, produce gastric acid and enz.

Gastric - when food in stomach
- Sensory input from food - stretch, chem, PH change, peptides from food
- Mediated by parasymp & enteric nerve reflexes, hormones (gastric)

Intestinal -
- Food in intestines
- Sensory input from food - stretch, chem
- Mediated by parasymp & enteric nerve reflexes, hormones (secretin, cck)