

Author(s): Aken Desai, Michael Mathis, 2008

License: Unless otherwise noted, this material is made available under the terms of the **Creative Commons Attribution – Share Alike 3.0**

License: <http://creativecommons.org/licenses/by-sa/3.0/>

We have reviewed this material in accordance with U.S. Copyright Law **and have tried to maximize your ability to use, share, and adapt it.**

Copyright holders of content included in this material should contact open.michigan@umich.edu with any questions, corrections, or clarification regarding the use of content.

For more information about **how to cite** these materials visit <http://open.umich.edu/education/about/terms-of-use>.

Student works are presented **as is** and may be an interpretation of faculty members' lectures or assignments. These student works are **not a product of faculty members**. Faculty do not guarantee the accuracy of student work nor endorse them in any way.

Any **medical information** in this material is intended to inform and educate and is **not a tool for self-diagnosis** or a replacement for medical evaluation, advice, diagnosis or treatment by a healthcare professional. Please speak to your physician if you have questions about your medical condition.

Viewer discretion is advised: Some medical content is graphic and may not be suitable for all viewers.

Nerves & Hormones

Tuesday, January 08, 2008
11:00 AM

1. Describe the overall role of the gastrointestinal system with respect to the absorption of nutrients and excretion of waste products.
 - a. Ingested material in
 - b. Passes through smooth muscle lined tract
 - c. Excreted out as feces
2. States the four general processes associated with GI function.
 - a. Secretion - glands
 - b. Digestion - chemical breakdown of food into molecules able to cross the mucosa (absorption) and gain entry into the blood
 - c. Motility - movement of bulk down tract
 - d. Absorption - nutrients
3. State approximate values of fluids entering and leaving the normal GI tract daily.
 - a. Ingest - 2 l/day
 - b. Secrete - 7 l/day
 - c. Absorb - 8.8 l/day
 - d. Feces - 0.2 l/day
4. Defines the cephalic, gastric and intestinal phases of GI tract regulation.
 - a. Cephalic - mouth
 - b. Gastric - stomach
 - c. Intestinal
5. Describes the classes of luminal stimuli that trigger GI reflexes.
 - a. Cephalic - taste, smell, sight, emotion
 - b. Gastric and Intestinal
 - i. Mechanoreceptors - volume, pressure
 - ii. Chemoreceptors - AA, FA, pH
 - iii. Osmoreceptors
- Not identified as an objective but described: Splanchnic Circulation
 - a. 25-30% of CO at rest
 - i. Increases after a meal
 - ii. Celiac, superior mesenteric, inferior mesenteric arteries
 - iii. Venous drainage into portal vein to liver
 - b. Microcirculation
 - i. Abundant
 - ii. High permeability
 - iii. Fenestrated capillaries
 - c. Lymphatics
 - i. Abundant
 - ii. 1 l/day of lymph to thoracic duct
 - iii. Main route of absorbed lipids reaching circulation
6. Names and locates the myenteric and submucous plexus.
 - a. Myenteric plexus is between longitudinal and circular muscle --> innervates muscle
 - b. Submucosal is between muscle and muscularis mucosae --> innervates mucosa
7. Describes the relation between the CNS, ENS and effector organs of the GI tract.
 - a. CNS
 - i. ANS as efferent fibers via PNS/SNS that synapse on the ENS
 - ii. Vagus nerve is primary neural control of GI tract
 - iii. Visceral nociceptive fibers travel in sympathetic nerves and enter spinal cord
 - iv. Vagus nerve synapses on ENS and can regulate GI function

- b. ENS
 - i. Myenteric --> smooth muscle
 - ii. Submucosal --> mucosa
- c. Effector organs
- 8. States the major excitatory and inhibitory neurotransmitters involved in the ENS.
 - a. Excitatory: Ach, Substance P
 - b. Inhibitory: NE, NO, Somatostatin
- 9. Defines the term "long reflex" and "short reflex" with respect to the GI tract.
 - a. Long Reflex
 - i. Information from receptors in smooth muscle relayed through ENS to higher centers via vagal afferents
 - ii. Trigger response carried by vagal efferents resulting in alteration of motility, secretion or hormone release
 - b. Short Reflex
 - i. Within wall of GI tract
 - ii. No CNS influence
- 10. Describes the similarities and differences in regulating GI function by nerves, hormones and paracrine regulators.
 - a. Nerves synapse on the viscera themselves and have very localized effects
 - b. Hormones are released into the blood stream and therefore have widespread effects
 - c. Paracrine regulation involves release of substances from local cells and therefore has localized effects
- 11. Describes the location of the endocrine cells secreting gastrin, secretin, and cholecystokinin (CCK).
 - a. Gastrin
 - i. synthesized in G cells of stomach
 - ii. released in response to protein and peptide or neural stimulation by Gastrin Releasing Peptide
 - iii. Causes gastric acid secretion and gastric mucosal growth
 - iv. Gastrinomas most common in pancreatic islets and lead to extreme acidity
 - b. CCK
 - i. synthesized in I cells of duodenum and jejunum
 - ii. released in response to protein and fat in intestine
 - iii. Causes gallbladder contraction, pancreatic enzyme secretion and inhibition of gastric emptying
 - c. Secretin
 - i. Synthesized by S cells in duodenal mucosa
 - ii. Released in response to acid in the duodenal lumen
 - iii. Stimulates bile and pancreatic HCO₃ secretion and inhibition of gastric acid secretion
 - iv. Gastric Inhibitory Peptide --> incretin
 - 1) Stimulates insulin secretion (main action)
 - 2) Inhibits gastric acid secretion
 - v. Glucagon
 - 1) Found in both pancreas and gut, but in gut processed to GLP1 and 2
 - 2) GLP-1 is an incretin
 - a) Stimulates insulin secretion
 - b) Has been found to have weight loss effects
 - 3) GLP-2 has a trophic effect on gut
 - vi. Vasoactive Intestinal Peptide
 - 1) Inhibitory to muscle but stimulates glandular secretion
 - 2) VIPomas result in secretory diarrhea
- 12. Describes the similarities in structure (identifies related hormones - does not memorize AA sequences) between gastrin, secretin, and CCK and between these and other hormones.
 - a. Gastrin and CCK have a common amidated carboxyl terminal; all CCKs and some Gastrins are sulfated; also have multiple forms as a result of cleavage

- b. Secretin-GIP-VIP-Glucagon are part of a family of enzymes as well
- 13. Defines the concept of "incretins" and states two GI hormones believed to function in this manner.
 - a. Incretins cause the release of insulin
 - b. GLP-2 and Secretin