22.2B: Gastrointestinal Reflex Pathways

The digestive system functions via a system of long reflexes, short reflexes, and extrinsic reflexes from gastrointestinal (GI) peptides that work together.

Learning Objectives

• Differentiate among the gastrointestinal reflex pathways

Key Points

• Long reflexes to the digestive system involve a sensory neuron that sends external or internal digestive information to the brain. This type of reflex includes reactions to food, emotion, or danger.
• Short reflexes to the digestive system provide shortcuts for the enteric nervous system (ENS) to act quickly and effectively, and form a sort of digestive brain. It reacts to digestive movement and chemical changes.
• The enterogastric reflex is stimulated by the senses. This reflex releases acid in the duodenum or in the stomach, and suppresses the release of digestive proteins.
• The gastrocolic reflex increases movement in the gastrointestinal tract, and reacts to stretches in the stomach walls as well as in the colon. It is responsible for the urge to defecate, the movement of digested material in the small intestine, and it makes room for more food within the stomach.
• The gastroileal reflex works with the gastrocolic reflex to stimulate the urge to defecate. It does so by opening the ileocecal valve and moving the digested contents from the ileum of the small intestine into the colon for compaction.
• GI peptides act on a variety of tissues including the brain, the digestive accessory organs, and the GI tract.
Key Terms

- **gastrocolic reflex**: One of the three extrinsic physiological reflexes that control the motility or peristalsis of the gastrointestinal tract; it involves an increase in the motility of the colon, creates the urge to defecate along with the gastroileal reflex, and helps make room for food in the stomach.

- **enterogastric reflex**: One of the three extrinsic reflexes of the gastrointestinal tract that is stimulated by the presence of acid levels in the duodenum or in the stomach. It releases acids and controls the release of stomach proteins such as gastrin.

- **gastroileal reflex**: One of the three extrinsic reflexes of the gastrointestinal tract that works with the gastrocolic reflex to stimulate the urge to defecate. This reflex is stimulated by the opening of the ileocecal valve and moves the digested contents from the ileum of the small intestine into the colon for compaction.

EXAMPLES

The gastrocolic reflex can cause irritable bowel syndrome. This can lead to abdominal pain, diarrhea, or constipation.

Food in the Digestive System

The digestive system has a complex system of food movement and secretion regulation, which are vital for its proper function. Movement and secretion are regulated by long reflexes from the central nervous system (CNS), short reflexes from the enteric nervous system (ENS), and reflexes from the gastrointestinal system (GI) peptides that work in harmony with each other.

In addition, there are three overarching reflexes that control the movement, digestion, and defecation of food and food waste:

1. The enterogastric reflex
2. The gastrocolic reflex
3. The gastroileal reflex

Long and Short Reflexes

Long reflexes to the digestive system involve a sensory neuron that sends information to the brain. This sensory information can come from within the digestive system, or from outside the body in the form of emotional response, danger, or a reaction to food.

These alternative sensory responses from outside the digestive system are also known as feedforward reflexes. Emotional responses can also trigger GI responses, such as the butterflies in the stomach feeling when nervous.

Control of the digestive system is also maintained by enteric nervous system (ENS), which can be thought of as a digestive brain that helps to regulate motility, secretion, and growth. The enteric nervous system can act as a fast, internal response to digestive stimuli. When this occurs, it is called a short reflex.
Three Main Types of Gastrointestinal Reflex

The Enterogastric Reflex

The enterogastric reflex is stimulated by the presence of acid levels in the duodenum at a pH of 3–4 or in the stomach at a pH of 1.5. When this reflex is stimulated, the release of gastrin from G-cells in the antrum of the stomach is shut off. In turn, this inhibits gastric motility and the secretion of gastric acid (HCl). Enterogastric reflex activation causes decreased motility.

The Gastrocolic Reflex

Peristalsis: The gastrocolic reflex is one of a number of physiological reflexes that control the motility, or peristalsis, of the gastrointestinal tract.

The gastrocolic reflex is the physiological reflex that controls the motility, or peristalsis, of the gastrointestinal tract. It involves an increase in motility of the colon in response to stretch in the stomach and the byproducts of digestion in the small intestine. Thus, this reflex is responsible for the urge to defecate following a meal. The small intestine also shows a similar motility response. The gastrocolic reflex also helps make room for food in the stomach.
The Gastroileal Reflex

The gastroileal reflex is a third type of gastrointestinal reflex. It works with the gastrocolic reflex to stimulate the urge to defecate. This urge is stimulated by the opening of the ileocecal valve and the movement of the digested contents from the ileum of the small intestine into the colon for compaction.

GI Peptides that Contribute to Gastrointestinal Signals

GI peptides are signal molecules that are released into the blood by the GI cells themselves. They act on a variety of tissues that include the brain, the digestive accessory organs, and the GI tract.

The effects range from excitatory or inhibitory effects on motility and secretion, to feelings of satiety or hunger when acting on the brain. These hormones fall into three major categories:

1. The gastrin family
2. The secretin family
3. A third family that is composed of the hormones that do not fit into either of these two families

LICENSES AND ATTRIBUTIONS

CC LICENSED CONTENT, SHARED PREVIOUSLY


CC LICENSED CONTENT, SPECIFIC ATTRIBUTION


• Medical Physiology/Gastrointestinal Physiology/Principles of GI function. Provided by: Wikibooks. Located at: en.wikibooks.org/wiki/Medical...Nervous_System. License: CC BY-SA: Attribution-ShareAlike


• Neural control gut. Provided by: Wikimedia. Located at: commons.wikimedia.org/wiki/Fi...ontrol_gut.png. License: CC BY-SA: Attribution-ShareAlike

• Medical Physiology/Gastrointestinal Physiology/Principles of GI function. Provided by: Wikibooks. Located at: en.wikibooks.org/wiki/Medical...tinal_Reflexes. License: CC BY-SA: Attribution-ShareAlike


LICENCES AND ATTRIBUTIONS

CC LICENSED CONTENT, SHARED PREVIOUSLY


CC LICENSED CONTENT, SPECIFIC ATTRIBUTION

- Amylase hydrolysis1-4. Provided by: Wikimedia. Located at: commons.wikimedia.org/wiki/Fi...lysis1_1-4.png. License: CC BY-SA: Attribution-ShareAlike
