

The Intestinal Phase

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The intestinal phase is a stage in which the duodenum responds to arriving chyme and moderates gastric activity through hormones and nervous reflexes. The duodenum initially enhances gastric secretion, but soon inhibits it.

The intestinal phase of gastric secretion begins when chyme first enters the small intestine (Figure 3). The intestinal phase generally starts after several hours of mixing contractions, when waves of contraction begin sweeping down the length of the stomach. Each time the pylorus contracts, a small quantity of chyme squirts through the pyloric sphincter.

The arrival of partially digested proteins in the duodenum stimulates G cells in the duodenal wall. These cells secrete gastrin, which circulates to the stomach and accelerates acid and enzyme production.

- Soon, however, the acid and semi-digested fats in the duodenum trigger the enterogastric reflex. That is, the duodenum sends inhibitory signals to the stomach by way of the enteric nervous system.

Chyme leaving the stomach relieves some of the distension in the stomach wall, thereby reducing the stimulation of stretch receptors. At the same time, the distension of the duodenum by chyme stimulates stretch receptors and chemoreceptors that trigger the enterogastric reflex.

(Figure 3)

(c) The Intestinal Phase

Function:

Control rate of chyme entry into duodenum

Duration:

Long (hours)

Mechanisms:

Neural: short reflexes (enterogastric reflex) triggered by distension of duodenum

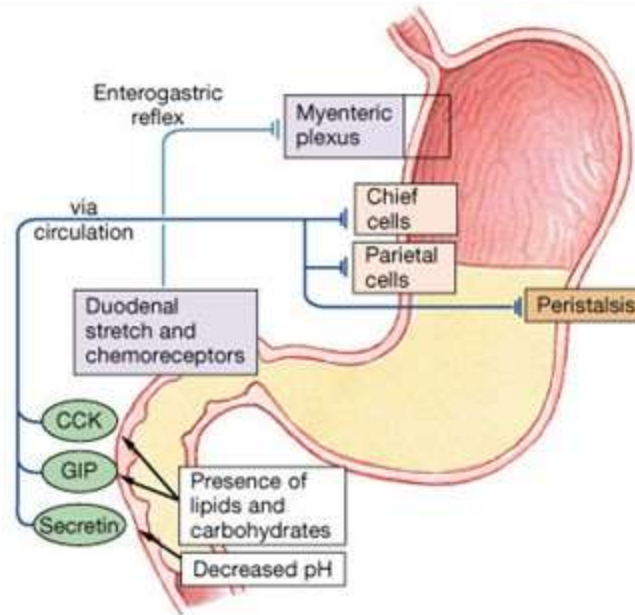
Hormonal:

Primary: stimulation of cholecystokinin (CCK), gastric inhibitory peptide (GIP), and secretin release by presence of acid, carbohydrates, and lipids

Secondary: release of gastrin stimulated by presence of undigested proteins and peptides (not shown)

Actions:

Feedback inhibition of gastric acid and pepsinogen production; reduction in gastric motility



This reflex inhibits stimulation of gastrin production and gastric contractions, as well as stimulating the contraction of the pyloric sphincter. The net result is that immediately after chyme enters the small intestine, gastric contractions decrease in strength and frequency, and further discharge of chyme is prevented, giving the duodenum time to deal with the arriving acids before the next wave of gastric contraction.

Hormonal Responses. Several hormonal responses are triggered by the arrival of chyme in the duodenum: The arrival of lipids (especially triglycerides and fatty acids) and carbohydrates in the duodenum stimulates the secretion of the hormones **cholecystokinin (CCK)**, **and gastric inhibitory peptide (GIP)**. CCK inhibits gastric secretion of acids and enzymes; GIP, which also targets the pancreas, inhibits gastric secretion and reduces the rate and force of gastric contractions.

A drop in pH below 4.5 stimulates the secretion of the hormone **secretin** by enteroendocrine cells of the duodenum. Secretin inhibits parietal cell and chief cell activity in the stomach. It also targets two accessory organs: the pancreas, where it stimulates the production of buffers that will protect the duodenum by neutralizing the acid in chyme, and the liver, where it stimulates the secretion of bile.