HORMONAL REGULATION OF DIGESTIVE ENZYME SECRETION (M.Pal)

The primary function of the gastrointestinal tract is nutritive to our bodies via the processes of ingestion, motility, secretion, digestion, and absorption; this occurs through complex coordination of digestive processes that are regulated by intrinsic endocrine and nervous systems. GI tract is the largest endocrine organ in the human body that play an integral role in regulating functions of the GI tract. absorption



The GI hormones classify as endocrines, paracrine, or neurocrine based on the method by which the molecule gets delivered to its target cell(s). Endocrine hormones are secreted from enteroendocrine cells directly into the bloodstream, passing from the portal circulation to systemic the circulation, before being delivered to target cells with receptorspecificity for the hormone. The five GI hormones that qualify as endocrines are gastrin, cholecystokinin (CCK), secretin, glucosedependent insulinotropic peptide (GIP), and motilin. Enteroendocrine cells also

secrete paracrine hormones, but they diffuse through the extracellular space to act locally on target tissues and do not enter the systemic circulation. Two examples of paracrine hormones are somatostatin and histamine. Additionally, some hormones may operate via a combination of endocrine and paracrine mechanisms. These "candidate" hormones are glucagon-like peptide-1 (GLP-1), pancreatic polypeptide, and peptide YY. Lastly, neurocrine hormones get secreted by postganglionic non-cholinergic neurons of the enteric nervous system. Three neurocrine hormones with significant physiologic functions in the gut are vasoactive intestinal peptide (VIP), gastrin release peptide (GRP), and enkephalins.

SYNTHESIS OF GI HORMONES

Gastrointestinal hormones undergo synthesis in specialized cells of the GI tract mucosa known as enteroendocrine cells. Enteroendocrine cells are specialized endoderm-derived epithelial cells that originate from stem cells located at the base of intestinal crypts. These cells are dispersed throughout the GI mucosa.

G cells secrete gastrin in the stomach and the duodenum in response to the presence of breakdown products of protein digestion (such as amino acids and small peptides), distention by food, and vagal nerve stimulation via GRP. More specifically, phenylalanine and tryptophan are the most potent stimulators of gastrin secretion among the protein digestion products. The vagal nerve stimulation of gastrin secretion is unique because gastrin and motilin are the only hormones released directly by neural stimulation.

CCK is secreted from I cells in the duodenum and iejunum in acids response and to monoglycerides (but not triglycerides), as well as the of protein presence digestion products.

Secretin is secreted from S cells in the duodenum in response to H+ and fatty acids in the lumen. Specifically, a pH less than 4.5 signals arrival of gastric contents, which initiates the release of secretin.

GIP is secreted by K cells in the duodenum and jejunum in response to glucose, amino acids, and fatty acids. GIP is the only GI hormone with a response to all three macronutrient types, and newer studies suggest that changes in intraluminal osmolarity may be what stimulates GIP secretion.



GLP-1 is also produced in the small intestine and secreted from L cells. The presence of hexose and fat stimulate its release. Pancreatic polypeptide and peptide YY are secreted by protein and fat, respectively, although their functions are unknown.

FUNCTIONS

Gastrin

- Stimulates H+ (acid) secretion by parietal cells in the stomach
- Trophic (growth) effects on the mucosa of the small intestine, colon, and stomach
- Inhibits the actions of Secretin and GIP
- Inhibited by H+

ССК

- Contraction of the gallbladder with simultaneous relaxation of the sphincter of Oddi
- Inhibits gastric emptying
- Stimulates secretion of pancreatic enzymes: lipases, amylase, and proteases
- Secretion of bicarbonate from the pancreas
- Trophic effects on the exocrine pancreas and gallbladder

Secretin

- Inhibits gastrin, H+ secretion, and growth of stomach mucosa
- Stimulates biliary secretion of bicarbonate and fluid
- Secretion of bicarbonate from the pancreas
- Trophic effect on the exocrine pancreas

GIP

- Stimulation of insulin secretion
- Induces satiety
- In large doses, decreases gastric acid secretion



In large doses, decreases the motor activity of the stimulatory of the influence of H malari infection on this secretion stomach and therefore slows gastric emptying when the upper small intestine is already full of food products.

- Stimulates the activity of lipoprotein lipase in adipocytes
- Protects beta-cells of the pancreas from destruction by apoptosis

GLP-1

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- Decreases gastric emptying
- Induces satiety
- Increases sensitivity of pancreatic beta-cells to glucose.

Motilin

• Increases gastrointestinal motility by stimulating the "migrating motility" or "myoelectric complex" that moves through the fasting stomach and small intestines every 90 minutes. This cyclical release and action get inhibited by the ingestion of food. Not much is known about this peptide, except for this essential function.