Gastrointestinal Hormones
History/Background
• Secretin - 1st hormone discovered
• 4 clearly functional hormones
  – Gastrin, Secretin, CCK, GIP
• Primary functions
  – Aid in digestion and movement of food
  – Release enzymes into the GI tract

Digestive Tract
• Saliva
• Sphincters
• Peristalsis
  – Para/symp inputs
• Pancreas
• Gall bladder

Physiological Roles of GI Hormones
• Stimulate secretion of enzymes that metabolize food
• Stimulate acid/base secretion to balance pH
• Act on smooth muscle to move food down the GI Tract
• Stimulate pancreatic hormones

Source
• Enterochromaffin cells
  – Clear cells scattered thru digestive tract (stomach thru the colon)
  – D cells- somatostatin
–G cells - gastrin
–S cells secretin

Chemistry

• Gastrin Family
  – Gastrin and CCK
• Secretin Family
  – Secretin, glucagon, VIP, GIP
• Many isoforms

Gastrin Family

• Gastrin and CCK
• C terminal ends are identical and contain the biological activity
• NH₂ end of the peptides responsible for target cell specificity

Gastrin Family of Hormones

Gastrin Isoforms

Gastrin

• Isolated 1964
• Found primarily in the Antral stomach mucosa/ G cells of the duodenal mucosa
• Stimulated by
  – , food in gut, peptides, aa’s ffa’s, vagus nerve (anticipation)
• Inhibited by:
  – GIP/somatostatin (paracrine)
  – starvation

Gastrin Functions

• Stimulates HCL and pepsinogin in the fundus
• Targets: histamine releasing cells, parietal cells (HCL)
• Sphincter tone, esophageal, pyloric
• Pancreatic enzymes, bicarb, water secretion
• Motor activity of intestine

Secretin Family
• Similar to glucagon in structure
• GIP/ VIP similar to Secretin and glucagon
• GLP-1 regulates pancreatic insulin secretion

Secretin Family of Hormones
  Secretin
• Peptide hormone of the SI
• Abundant in the duodenum - sparse in the ileum
• Made in the S cells
• Stimulated by acidification in the duodenum

Secretin Function
• Stimulates pancreatic secretion of bicarbonate
• Potentiates CCK stimulated enzyme secretions.

CCK
• Discovered by Ivy and Oldberg 1928
• 33 AA peptide
• I cells in the SI
• Stimulated by:
  – L isomers of AA’s, HCL, FA’s

CCK Functions
• Stimulation of Pancreatic enzyme secretion
• Inhibition of gastric emptying
• Potentiates secretin induced bicarb secretion from the pancreas
• Regulates growth of exocrine pancreas

GIP
• 43 aa peptide
• K cells of the SI
• Stimulated by
– Fat ingestion
  • Inhibits gastric acid secretion
  
  **GIP Function**
  • Inhibits gastric acid secretion
  • Potentiates insulin release
  • Activates proteolipases in adipose cells
  • Increases fat anabolism

**VIP**

• 28 aa peptide
• Similar secretin, glucagon, GIP
• Named for vasodilator and hypotensive effects

**VIP effects**

• Relaxes smooth muscles
• Inhibits gastric acid secretion
• Increases bile flow
• Increases pancreatic water and electrolyte secretion.
• Stimulates lipolysis, glycogenolysis, insulin secretion

**Candidate Hormones of the Gut**

Hormone-Metabolite Control of GI Function 1
Hormone-Metabolite Control of GI Function 2