THE COLON AS AN ENDOCRINE ORGAN

James C. Thompson, M. D.
Professor and Chairman
Department of Surgery
The University of Texas Medical Branch
Galveston, Texas

Until recently, the colon was rarely considered in any assessment of gut function as an endocrine organ. Several studies have shown, however, that intracolonic perfusion with nutrients has an inhibitory effect on proximal gastrointestinal (GI) functions. The human colon and rectum contain peptides and amines in both mucosal endocrine cells (suggesting a hormonal role) and neurons and nerve terminals (suggesting a neurotransmitter function).

The rectum is second only to the proximal intestine in number of mucosal endocrine cells per square cm of mucosa. The typical colorectal endocrine cell is basket- or flask-shaped and contains secretory granules in the basal cytoplasm and microvilli in the luminal pole. Some endocrine cells send long cytoplasmic processes to the neighboring epithelial cells, suggesting a paracrine function.

Ultrastructural studies suggest four major endocrine cell populations in the human colon. The most numerous in the enterochromaffin (EC) or type I cell, which makes up 60%. In addition to 5-hydroxytryptamine (5-HT or serotonin), other biogenic amines may be present in EC cells and be responsible for their formaldehyde-induced fluorescence and argent-affinity. Type IV, or L cells, make up only 7%, but they are the site of storage of the most active colonic-borne peptides known at the present time. L-cells co-store glucagon-like immunoreactivity (glicentin or enteroglucagon) and peptide tyroside tyrosine (PYY). Intestinal L cells are considered precursors in the phylogenetic evolution towards pancreatic glucagon-containing A cells.

Colon and rectal mucosa contain the highest concentration of PYY immunoreactivity in the gut. Plasma enteroglucagon and PYY levels rise above normal in patients with malabsorption caused by several diseases. These changes may play a role in the development of the disease or act as regulatory colonic mechanisms.

The colon contains several cell populations storing more than one secretory product. Genetically related (for example, glucagon-glicentin-oxyntomodulin-GLP1-GLP2) and apparently unrelated (for example, glicentin-PYY) peptides coexist within the same colonic endocrine cell.

Perfusion studies in experimental animals and in humans have shown that the colon has an inhibitory effect on pancreatic exocrine, biliary, and gastric acid secretions, as well as in the release of CCK. Furthermore, colectomy results in enhanced release of CCK and gastrin in dogs and in stimulation of pancreatic growth, and in an increase in the amounts of gastrin and insulin in rats. The colon clearly plays an inhibitory role on some GI and pancreatic exocrine and endocrine secretions.