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Intestines

Wednesday, January 16, 2008

1:00 PM

General Feature of Intestine

1. Plicae (circular folds) - valves of Kerckring are permanent
 - i. Submucosal connective tissue core
 - ii. Slow movement of chyme and increase surface area
2. Villi
 - i. Fingerlike projections of mucosa on plicae
 - ii. Crypts of Lieberkuhn below
 - 1) Lumen appears in middle of crypts
 - 2) Invaginates into underlying lamina propria
 - iii. Cells have brush border
 - iv. Core is made of lamina propria full of WBCs
 - v. Simple columnar epithelium
 - vi. Fibers of smooth muscle from muscularis mucosa run in core to contract villi (propels blood, lymph from core)
 - vii. In cross section, lumen is outside
3. Microvilli
 - i. Composed of actin
 - ii. Glycocalyx holds digestive enzymes
4. Enteric Nervous System
 - i. Huge nervous cells: large, oval cells in small ganglia (<5 cells)
 - ii. Meissner's plexus (submucosal)
 - 1) Controls blood vessels, muscularis mucosa tone, secretion
 - 2) Located between circular muscle and submucosa
 - iii. Auerbach's plexus (myenteric)
 - 1) Located between longitudinal and circular layers of muscularis externa
 - 2) Controls muscularis externa
5. Epithelial Cell Types
 - i. Enterocytes: absorption; majority of cells
 - ii. Goblet cells
 - 1) Increase as distal
 - 2) Produce acid glycoproteins (mucins)
 - 3) Stained by alcian blue or PAS
 - 4) Clear cytoplasm, just like goblet cells seen earlier
 - iii. Enteroendocrine cells
 - 1) Affect secretory and contractile activities by secreting hormones
 - 2) Clear cytoplasm, round nucleus, granules are basal
 - iv. Paneth cells
 - 1) Located at base of crypts
 - 2) Exocrine secretion of lysozyme --> antibacterial
 - 3) Nucleus towards base, granules apical
 - v. Stem cells also visible in lower quadrant of crypts
 - 1) Each stem cell gives rise to 4 cell lineages
 - 2) Cells differentiate as they migrate out of crypts and up the villi
 - 3) Cells at apex slough off into lumen
 - 4) Entire epithelium turns over every 3-4 days
 - 5) Each crypt contributes to a small stripe on the villus (multiple crypts/villus)

A. Small Intestine

1. Duodenum

- i. Submucosal glands (Brunner's glands)
 - 1) Ducts open penetrate into muscularis mucosae and open into crypts
 - 2) Secrete alkaline mucous to neutralize stomach acid
 - ii. PAS stains carbohydrates and negative charges magenta
 - 1) Goblet cells
 - 2) Brunner's glands
 - 3) Brush border b/c of glycocalyx
2. Jejunum and Ileum
- i. Mucosa clearly demarcated from submucosa by prominent muscularis mucosae
 - ii. Heavy lymphatic infiltration of lamina propria
 - iii. Submucosa appears as irregular connective tissue
 - iv. Mitotic figures in crypts
 - v. Gut Associated Lymphoid Tissue
 - 1) 1/4 of mucosa
 - 2) Plasma cells, Mphages, lymphocytes in lamina propria and submucosa
 - 3) Intraepithelial lymphocytes - specialized T cells
 - 4) Lymph nodules in lamina propria
 - a) Activated leukocytes go to nearby lymph nodes, activating T + B cells that go to GI mucosa
 - b) Plasma cells develop from activated B in follicles and migrate to lamina propria to secrete antibodies
 - 5) Peyer's Patches: large aggregates of nodules; only in ileum, technically
 - a) Covered by M cells specialized for uptake and presentation of antigen to underlying Mphages and lymphocytes)
 - b) Found in appendix as well
 - c) M cell surface surrounds macrophages and other cells in Peyer's patch

B. Large Intestine

- 1. Colon
 - i. No villi
 - ii. Thick muscularis mucosae
 - iii. Thick inner circular muscle
 - iv. Longitudinal muscle is variably present b/c teniae coli do not surround the entire colon
 - v. Rich in goblet cells
 - vi. Tightly packed crypts
- 2. Appendix
 - i. Mucosa similar to colon
 - ii. Muscularis externa has 2 layers like small intestine
 - iii. Lymphoid nodules all over submucosa, extend into mucosa
- 3. Recto-Anal Junction
 - i. Narrow zone of transition from columnar epithelium to stratified squamous epithelium
 - ii. Non-keratinized proximal, keratinized distally
 - iii. Internal sphincter is smooth muscle, external sphincter is skeletal muscle
 - iv. Dermal sebaceous glands and adipose tissue in wall of anal canal
 - v. Dilated submucosal vessels = "internal" rectal hemorrhoids