



## Section 4

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# Digestion in Small Intestine

- **Pancreatic secretion** ✓
- **Bile secretion** ✓
- **Small intestine secretion** ✓
- **Motility of the small intestine**

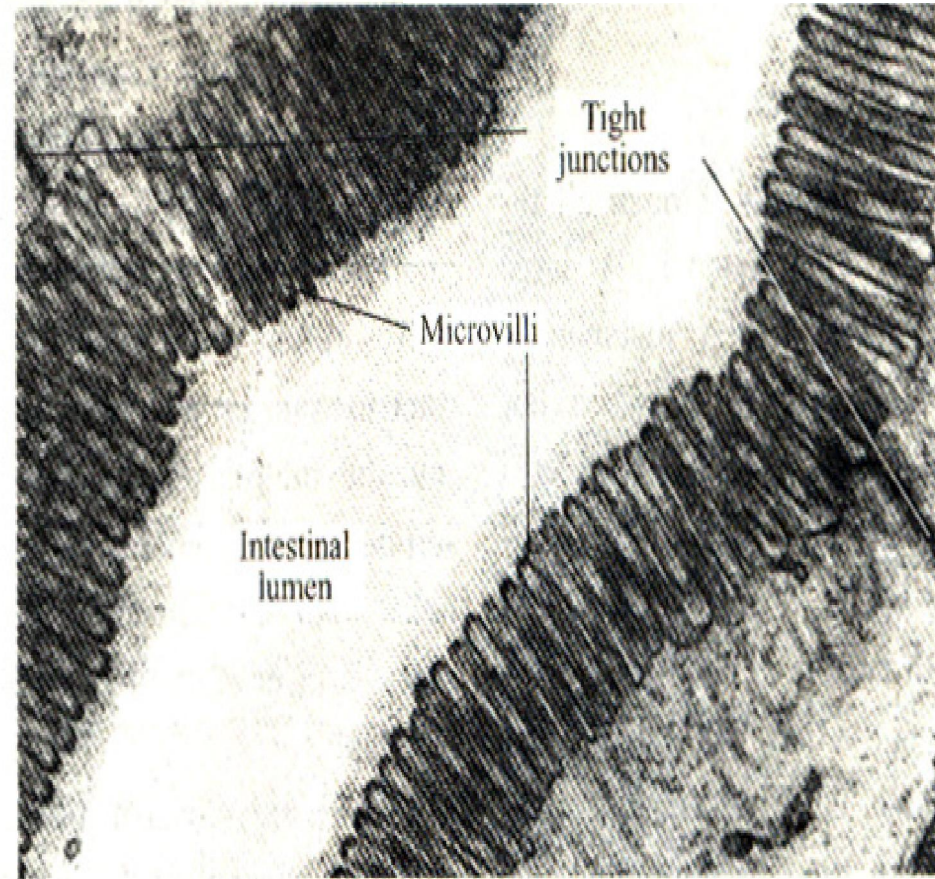
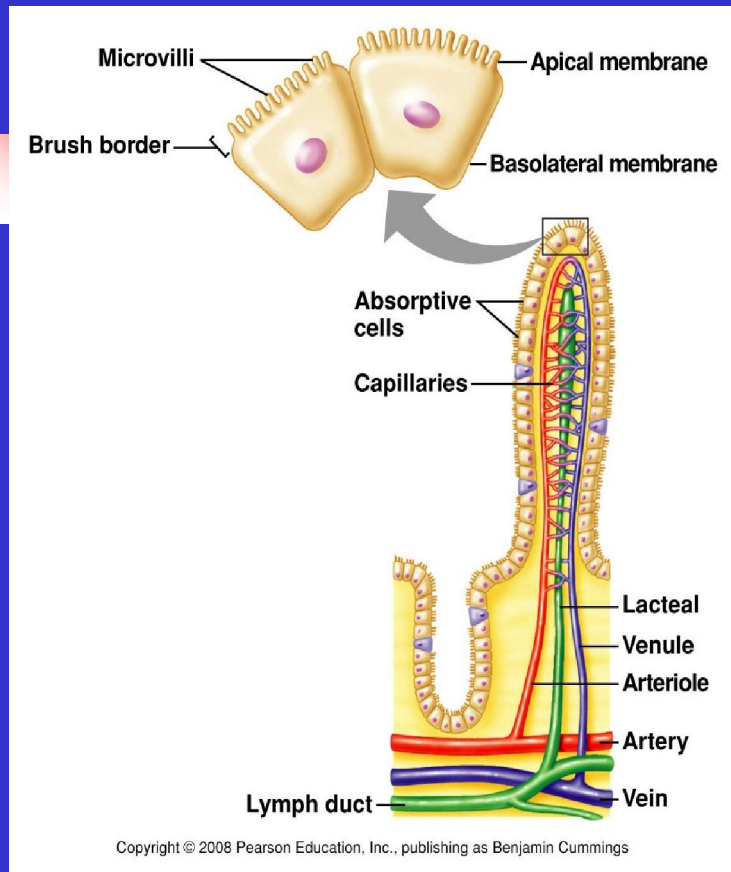


Figure 6-15 Microvilli on the surface of intestinal epithelial cells.

**Brush border: Membrane digestion enzymes**

- **Maltase:** hydrolyze maltose/maltotriose into glucose
- **Lactase:** hydrolyze lactose into galactose and glucose
- **Sucrase:** hydrolyze sucrose, maltose and maltotriose into glucose and fructose
- **$\alpha$ -dextrinase:** hydrolyze dextrin, maltose, maltotriose into glucose
  
- **Aminopeptidase:** remove amino acid from amino-end
- **Carboxypeptidase:** remove amino acid from carboxyl-end.
- **Endopeptidase:** break peptide from the middle
- **Dipeptidase:** break dipeptide into amino acid



## 4. Intestinal Motility

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- **Migrating motor complex (MMC) at fasting**
- **MMC is a periodic wave originating from the stomach and migrating to the small intestine (5~10 cm/min ) during fasting**
- **It occurs every 90~120 min.**
- **MMC is controlled by motilin.**

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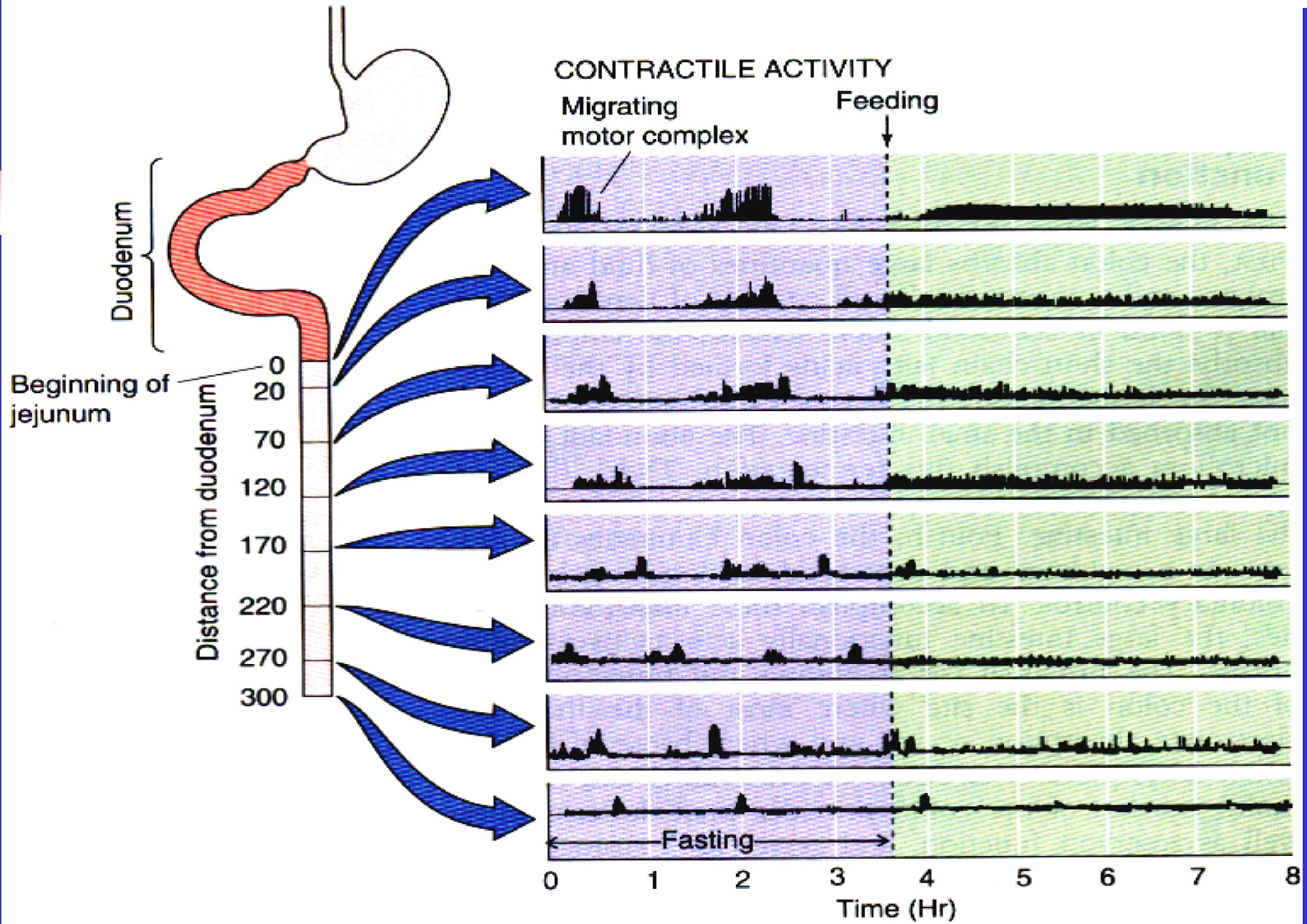


## ■ MMC includes three phases

**I:** no action potential, no contraction, 45~60 min

**II:** irregular AP and contractions, 30~45 min

**III:** high frequency/magnitude motility, 5~10 min  
migrate from the stomach to small intestine





## **Actions of MMC**

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- **Clear any indigested material in the stomach and small intestine in preparation for the next meal**
- **Prevent bacteria from remaining in the small intestine long enough to grow/multiply excessively (diarrhea)**



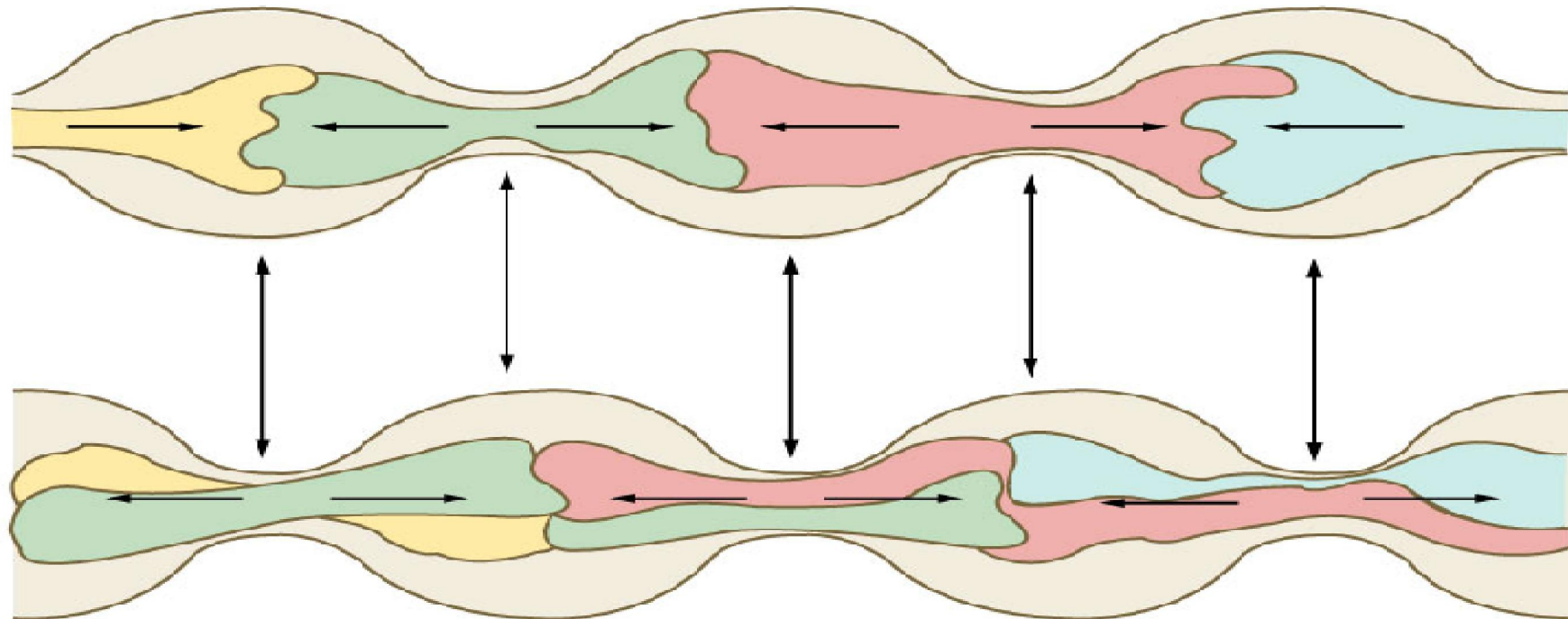


# Intestinal motility after a meal

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- **Tonic contraction**
  - a weak, continuous contraction
- **Segmentation contraction**
- **Peristalsis to propel the chyme toward the large intestine**

## Segmental contractions are responsible for mixing



No net forward movement

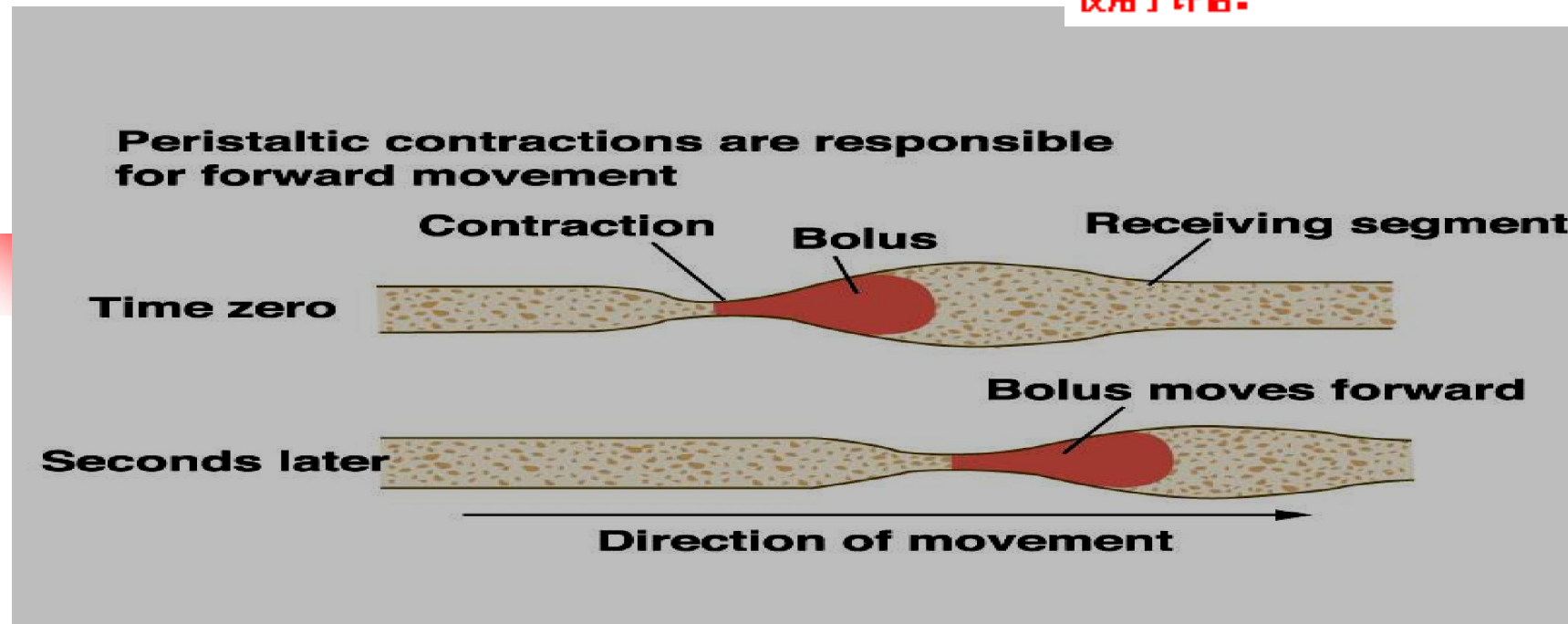
- **1-5cm segments alternately contract and relax (circular M), while longitudinal M relax**
- **Frequency:** duodenum: 12/min; ileum: 9/min
- **Controlled by intestinal basic electrical rhythm**
- **Regulated by humoral and neural mechanism**



# **Actions of segmentation contraction**

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- **Mix intestinal contents with digestive juices to facilitate digestion**
- **Make chyme contact with the wall of intestine to facilitate absorption**
- **Facilitate return of blood and lymph via rhythmic contraction and relaxation**



- Peristalsis is slow (0.5-2.0cm/s) and occur at any site of small intestine.
- **Function:** to move the intestinal contents forward for new segmental movement (3~8h)
- **Peristaltic rush:** strong/fast (2-25 cm/s) peristalsis



## ■ Regulation of intestinal motility

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**(1) the intestinal basic electrical rhythm  
of smooth muscle**

**duodenum: 12/min; ileum: 9/min**

**(2) Nervous regulation**

**Intrinsic nerve : main**

**Extrinsic nerve :**

**- Parasympathic N: + intestinal motility**

**- Sympathetic N: - intestinal motility**



# Regulation of intestinal motility

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## (3) Humoral regulation

**+: Gastrin, CCK, motilin, 5-HT**

**(5-hydroxytryptamine, serotonin)**

**-: Secretin, GIP, Vasoactive intestinal peptide (VIP)**