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M1 - GI Sequence

Colon and Review

John Williams, M.D., Ph.D.

Winter, 2009
THE HUMAN COLON

Functions
1. Storage
2. Absorption of salt and water
3. Digestion and Absorption
Response of the Ileoceleal Sphincter to distension of the Ileum or Cecum

These are local reflexes in the myenteric plexus.
Colonic Motility

1. Slow wave frequency variable but highest in transverse colon and the rectum (11/min)

2. Contractions increase after feeding

3. Mass Peristalsis after a meal termed the “Gastro-Colic reflex
The Process of Haustral Shuttling and Propulsion

A. A quiescent segment of colon.

B. Haustral shuttling with no net movement of chyme.

C. Haustral shuttling with propulsion of chyme from one haustrum to another.

D. Multihastral propulsion with movement of chyme through several haustra.

Contractions increase after feeding

Fig. 8-6 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
Response of the Rectum and Anal Sphincters to Rectal Distension

Fig. 8-9 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
Hirschsprung's Disease

1. Myenteric plexus in colon normally exerts a net inhibitory influence.

2. When neurons are absent in rectum the aganglionic Segment is contracted resulting in a large distended Colon.

3. Treatment is to surgically remove the segment.
The Effect of Dietary Fiber on Colonic Transit Time and Stool Weight

Fig. 8-8 Granger, D, et al. *Clinical Gastrointestinal Physiology*. W.B. Saunders, Philadelphia, PA; 1985.
Normally about 1 to 1½ liters per day of flatus

<table>
<thead>
<tr>
<th>Gas</th>
<th>Stomach (%)</th>
<th>Intestine (%)</th>
<th>Flatus (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>79</td>
<td>64</td>
<td>61.2</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>4</td>
<td>14</td>
<td>8.1</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>0</td>
<td>19</td>
<td>19.8</td>
</tr>
<tr>
<td>Methane</td>
<td>0</td>
<td>8.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Oxygen</td>
<td>17</td>
<td>0.7</td>
<td>3.6</td>
</tr>
</tbody>
</table>

*Swallowed air* and *Bacterially Produced*

Source Undetermined
Role of the Cecum in Fermentation and Absorption

Magnitude of the Bacterial Population in the Gut

Fig. 8-4 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
Hydrogen gas production in the small intestine and colon in response to lactose ingestion of certain foods such as beans rich in indigestible carbohydrates leads to massive increase in hydrogen content and increased flatus.

Ion Transport Pathways in the Human Colon

Fig. 12-3 Johnson, L. Gastrointestinal Physiology, 7th ed. Mosby Elsevier, Philadelphia, PA; 2007: 130.
Relationship Between Ileocecal Flow, Colonic Water Absorption and Stool Water in Health and in Various Disease States

Fig. 8-2 Granger, D, et al. *Clinical Gastrointestinal Physiology*. W.B. Saunders, Philadelphia, PA; 1985. Modified (see additional source information).
DISACCHARIDES:
- Maltase
- Sucrase
- Lactase
- Isomaltase

PEPTIDASES:
- Aminopeptidase
- Carboxypeptidase
- Dipeptidase
- Enterokinase

Amylase
Pepsin
Lipase
Amylase
Trypsin
Chymotrypsin
Carboxypeptidase
Elastase
Lipase - Colipase
Phospholipase A2
Cholesterol esterase - nonspecific lipase

Fig. 9-1 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
The Interdigestive Period

Fig. 9-2  Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
The Cephalic Phase

The Gastric Phase

Fig. 9-4 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
The Early Intestinal Phase
The Late Intestinal Phase

Fig. 9-1 Granger, D, et al. *Clinical Gastrointestinal Physiology*. W.B. Saunders, Philadelphia, PA; 1985.
The Interdigestive Period

Fig. 9-2 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
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Slide 5 – Fig. 7-30 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.

Slide 7 – Fig. 8-6 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.

Slide 8 – Fig. 8-9 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.

Slide 10 – Fig. 8-8 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.

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Slide 13 – Fig. 8-4 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.


Slide 17 – Fig. 9-1 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.

Slide 18 – Fig. 9-2 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.

Slide 19 – Fig. 9-3 Granger, D, et al. Clinical Gastrointestinal Physiology. W.B. Saunders, Philadelphia, PA; 1985.
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