

3-Movements of the Small Intestine

■ Mixing Contractions (Segmentation Contractions)

- It is the slow waves in the smooth muscle itself that cause the segmentation contraction, (Myogenic) these contractions are not effective without background excitation mainly from the Myenteric nerve plexus.
- بتعمل mixing لل food مع ال enzymes الي بتطلع من ال pancreas وال duodenum وال Jejunum وكمان بتعرضها لل Vili عشان يصير لها

■ Propulsive (Peristalsis)Movements(progression and spread out of chyme)

0.5 to 2.0 cm/min faster in the proximal intestine and slower in the terminal intestine. (1 cm /min).

Food need 3-5 h transient time in small bowel

يعني قول 4h، زي ما بياخد وقت في stomach ال
ال colon يتخلف من 8 ل 24 ساعة

- Control of Peristalsis by Nervous and Hormonal Signals

- شو بفيديني هاد الكلام؟

لما بدنا نحسب ال motility في ال intestine، هل فيها حركة منيعة ولا لا،
بنستخدم radioactive colloidal material عشان نشوف، زي مثلاً في ال
emptying of the stomach بدنا نشوف اذا فيه delayed gastric
emptying الي اسمه Gastroparesis (من المواضيع المهمة الي بتصير عند
الناس الي معهم سكري)، في منه نوعين:

- acute gastroparesis:

بصير لو قطعنا ال vagus nerve بالغلط

- chronic gastroparesis:

بصير عند الناس الي عندهم سكر

- ال rapid emptying of the stomach اسمه Dumping

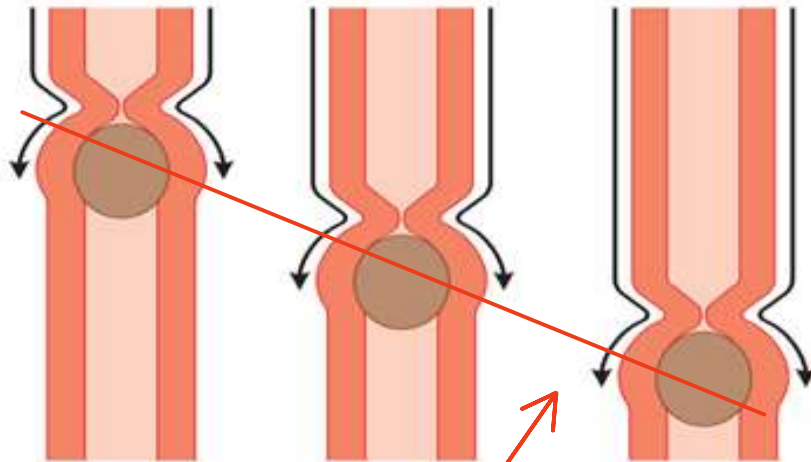
- لما بدنا نخلي واحد يصوم عشان عملية، قديش بنخليه يصوم؟ بنخليه
يصوم 6h لأنه المعدة زي ما حكينا بتفضى من 3-5 ساعات

Control of Peristalsis by Nervous and Hormonal Signals

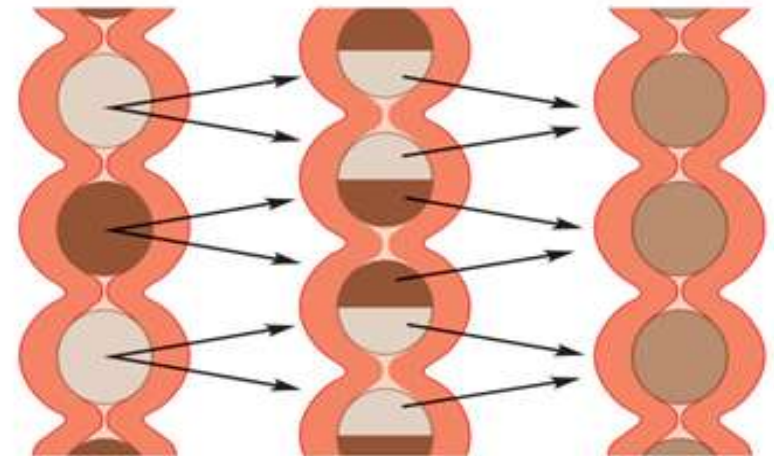
- Peristaltic activity is  after meal.
Stretch of small bowel by chyme  peristalsis.
- Gastro-enteric reflex  Peristaltic activity in SB.
- Hormones gastrin , Motilin ,CCK ,Insulin 
Peristalsis
- Secretin and glucagon  peristalsis.

- لاحظ يسطا انه ال gastro-enteric reflexes بتزود ال peristalsis وبتزود ال emptying، عكس ال entero-gastric reflexes ال بتعمل inhibition

site	Frequency of BER
Stomach	3/min
Duodenum	12/min
Distal ileum	8/min
Cecum	9/min
sigmoid	3 /min

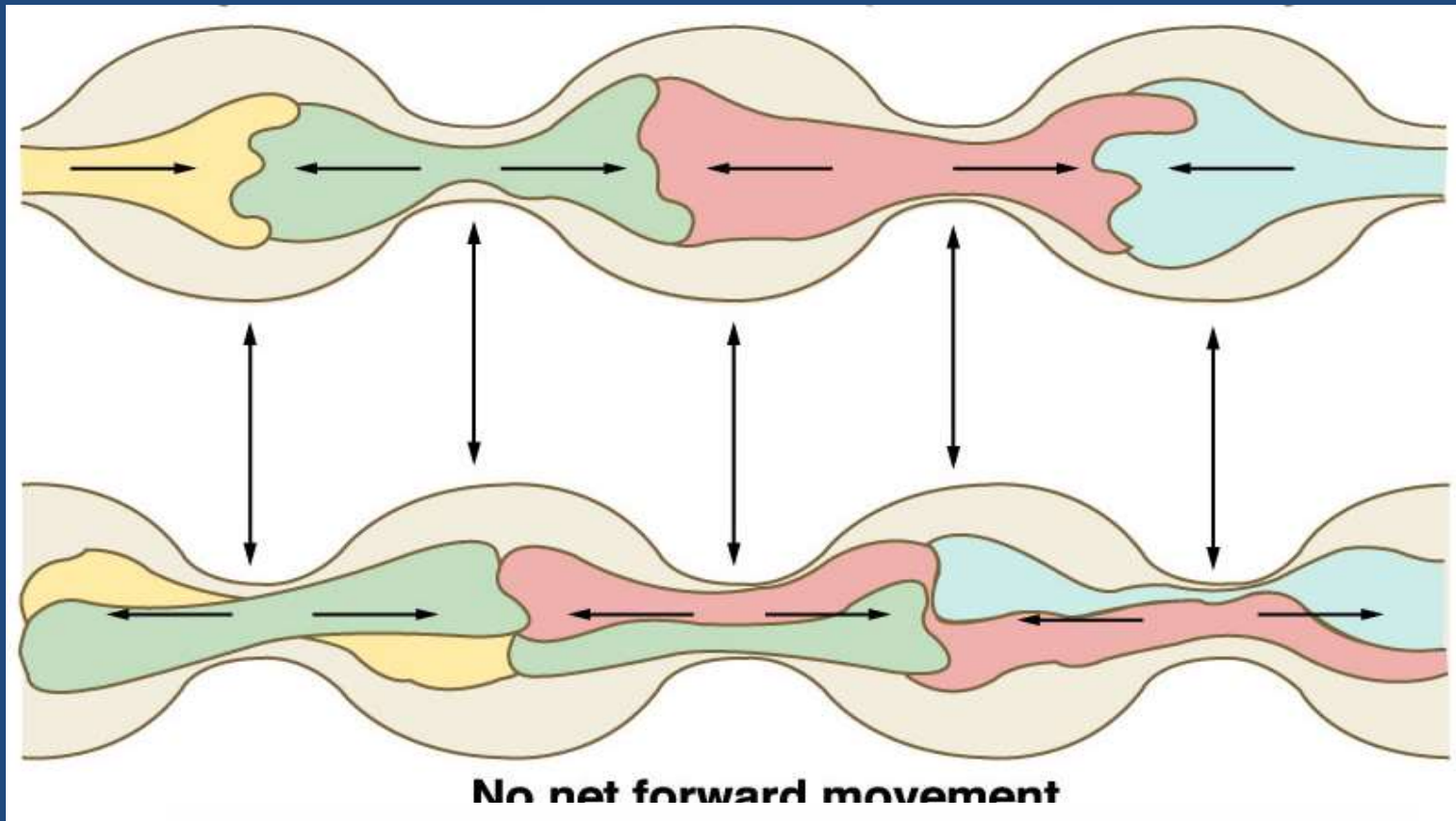


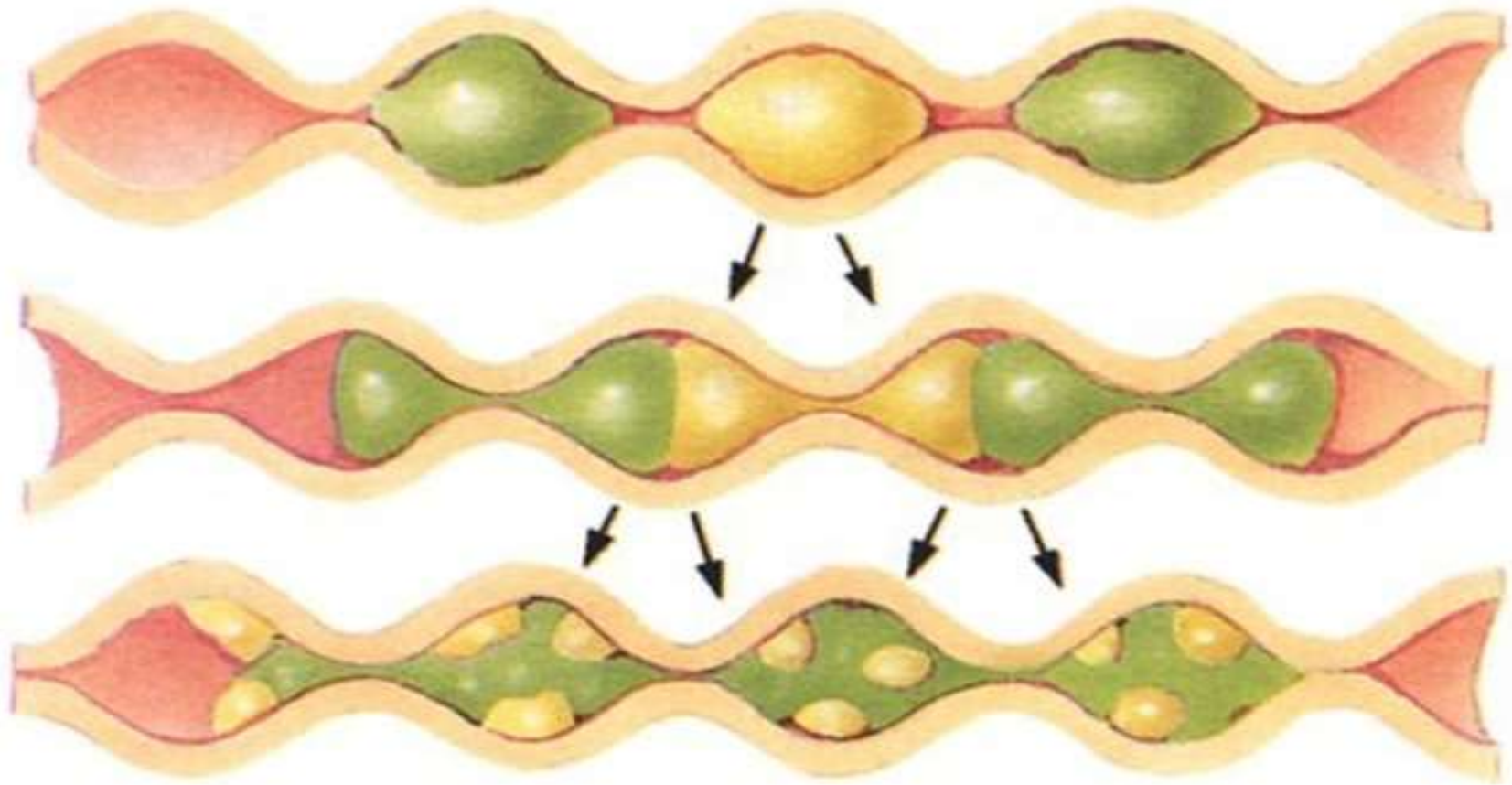
Peristalsis: Adjacent segments of alimentary tract organs alternately contract and relax, which moves food along the tract distally.



Segmentation: Nonadjacent segments of alimentary tract organs alternately contract and relax, moving the food forward then backward. Food mixing and slow food propulsion occurs

1-Segmentation: Mix contents to promote Digestion & absorption. It is **Myogenic** i.e. controlled by the basic electric rhythm (BER).



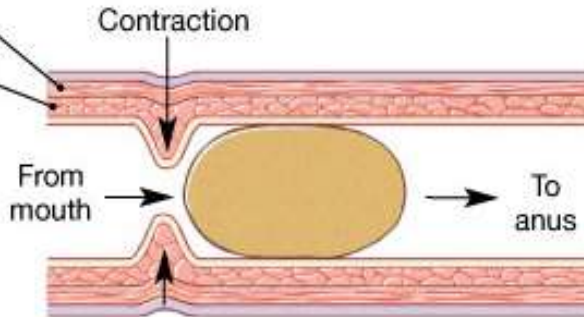


Mixing contraction of the Small Intestine.
Rhythmic Segmentations Bring Through Mixing
of the Intestinal Content

Longitudinal muscle
Circular muscle

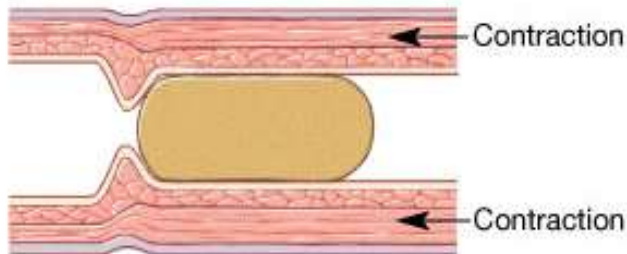
Step 1:

Contraction of circular muscles behind food mass



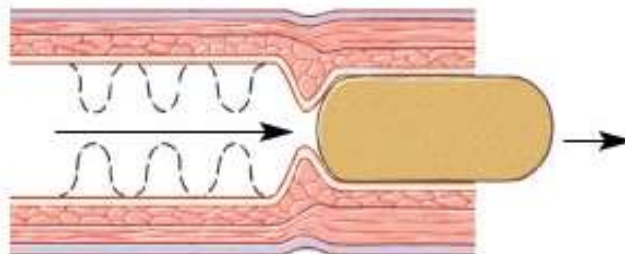
Step 2:

Contraction of longitudinal muscles ahead of food mass

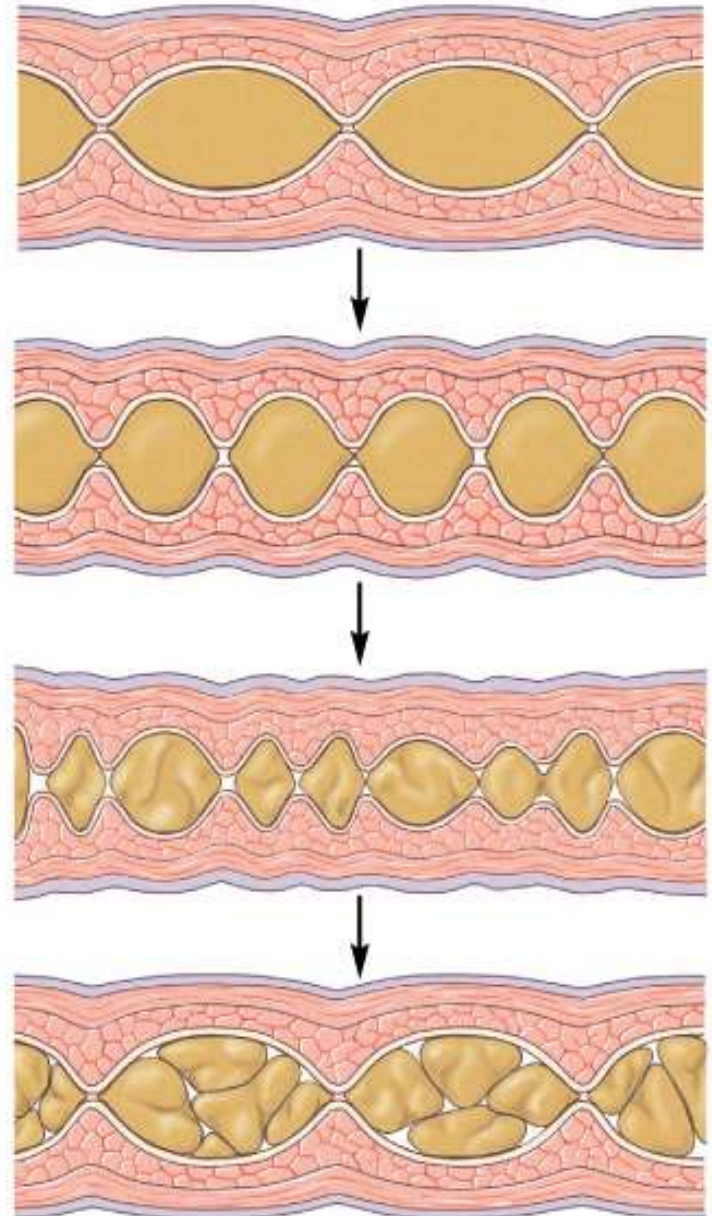


Step 3:

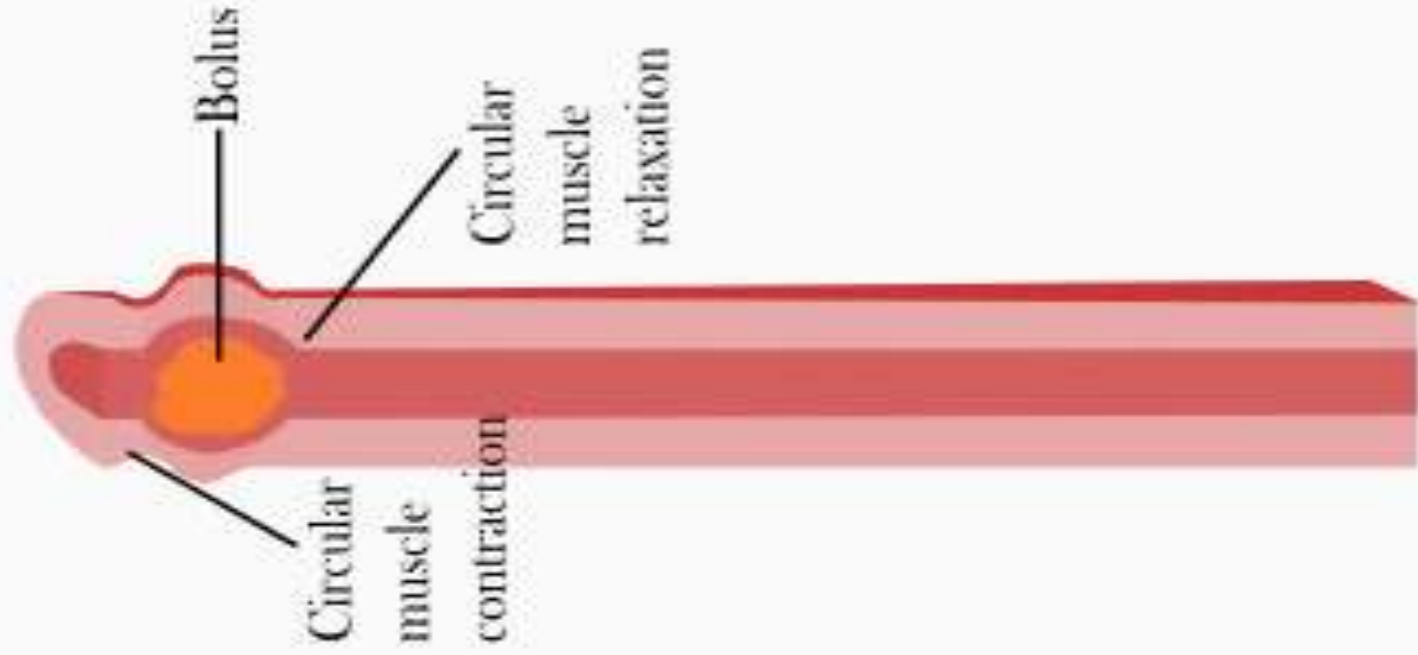
Contraction in circular muscle layer forces food mass forward



(a) Peristalsis



(b) Segmentation

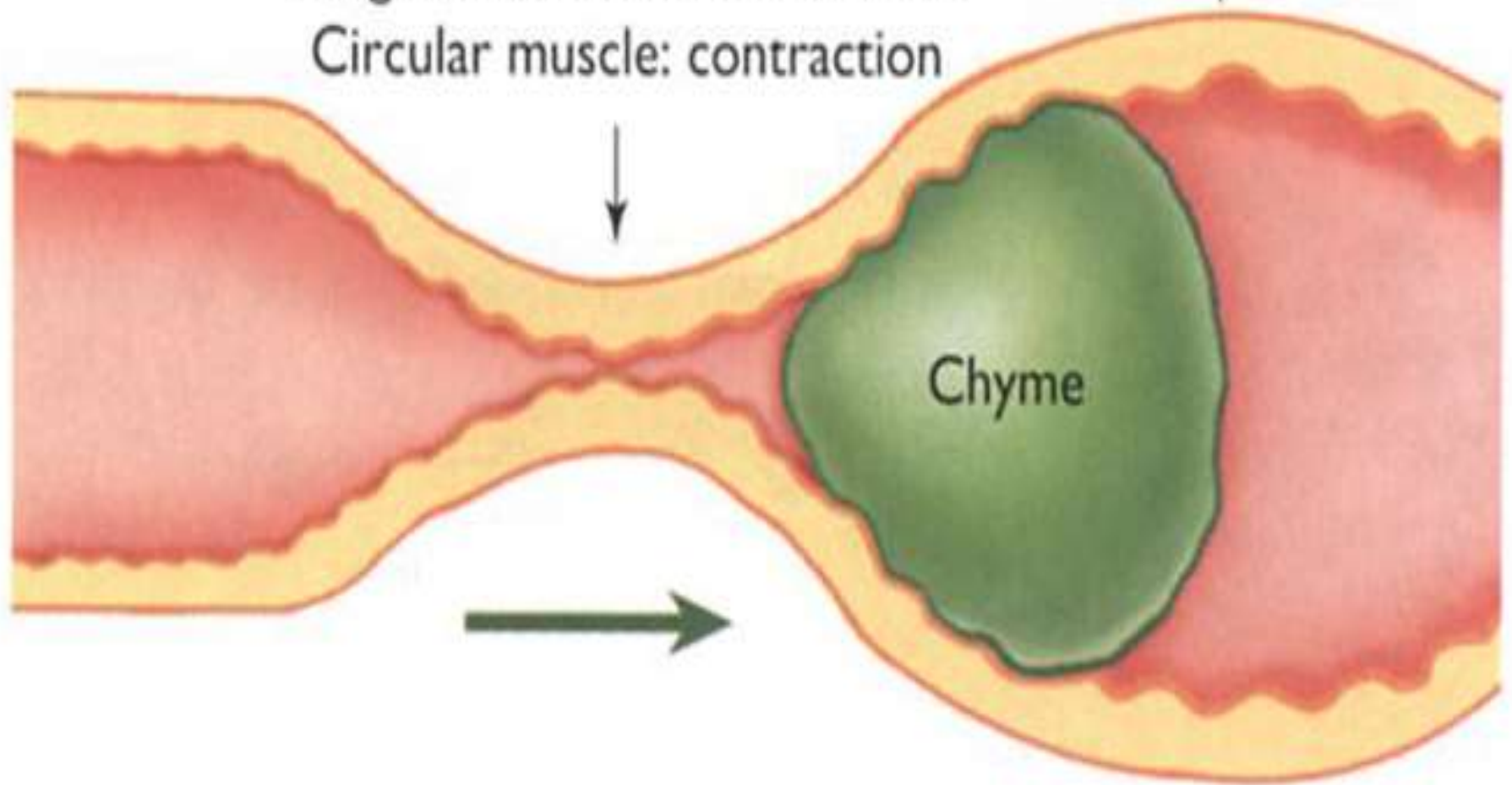


Longitudinal muscle: contraction

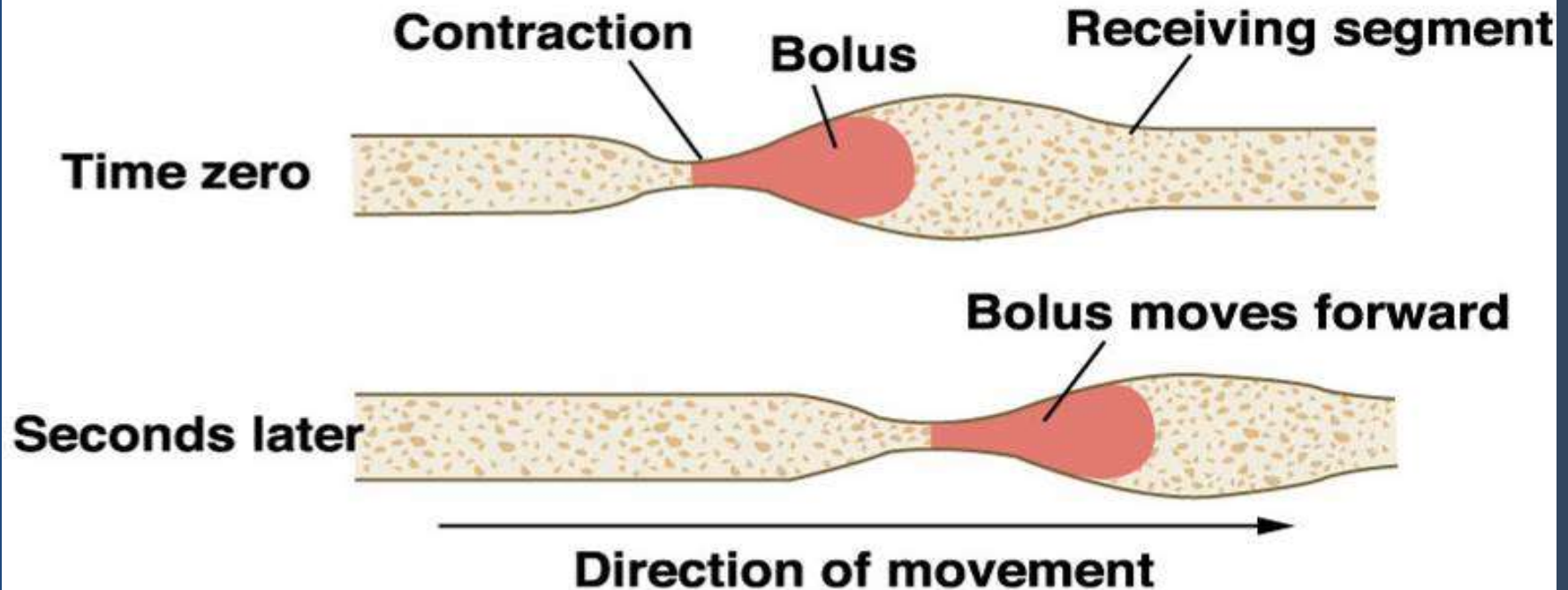
Circular muscle: relaxation

Longitudinal muscle: relaxation

Circular muscle: contraction



**Peristaltic contractions are responsible
for forward movement**



"law of the Gut"

■ The peristaltic reflex plus the anal direction of movement of the peristalsis is called the law of gut



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Intestinal Motility

<u>Peristaltic movement</u>	<u>Segmentation movement</u>
<u>Stimulus</u> Same for both 1- Distension of the duodenum or the stomach (gastro-enteric reflex). 2- mechanical or physical irritation.	Distension with chyme in the small intestine .
<u>Rate or velocity</u> Velocity= 0.5-2 cm/min slower distally, then die out after few cms.	Rate= 11-12 in the duodenum 8-9 in the terminal ileum
<u>Control</u> Neurogenic: Local Myenteric reflex (law of the gut)	<u>Myogenic</u> in nature (slow wave + spike potential on top)

Intestinal Motility

<u>Peristaltic movement</u>	<u>Segmentation movement</u>
<u>Description</u> Circular muscle contraction proximal to the bolus and receptive relaxation distal to it, While the longitudinal muscles relax proximal to the bolus and contract distal to it	Ring like contractions dividing a loop of the intestine into equal portions. Then, these contractions relax and a new set of contractions begin in the previously relaxed points.
<u>Functions</u> 1-Forward movement of food towards the ileocecal valve 2-Increase its exposure to the brush border	1-Mixing the contents with intestinal secretion 2-Spread out of the chyme along the intestinal mucosa

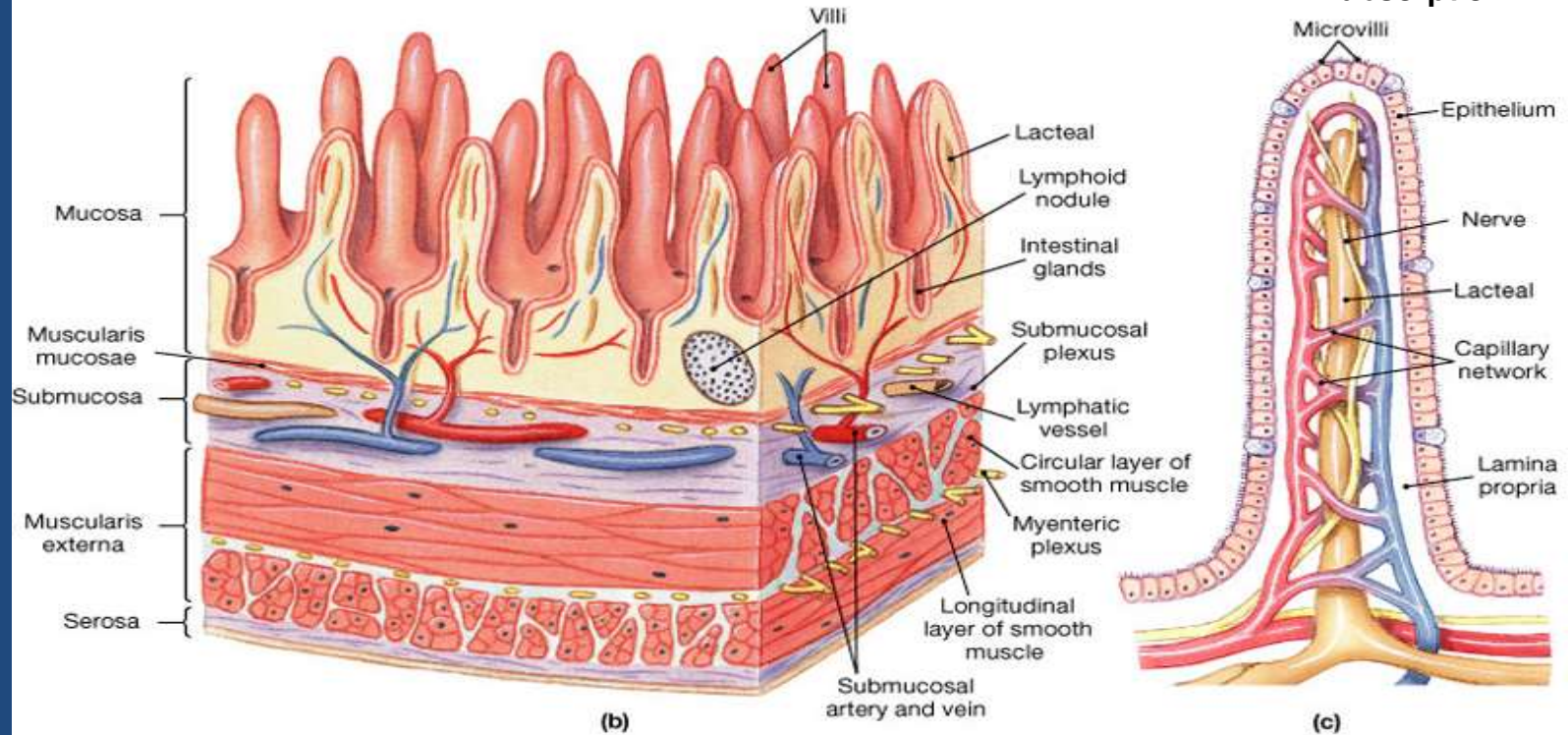
- ال muscularis mucosa بتزود ال surface area to facilitate more absorption

● Movements Caused by the Muscularis Mucosae and Muscle Fibers of the Villi

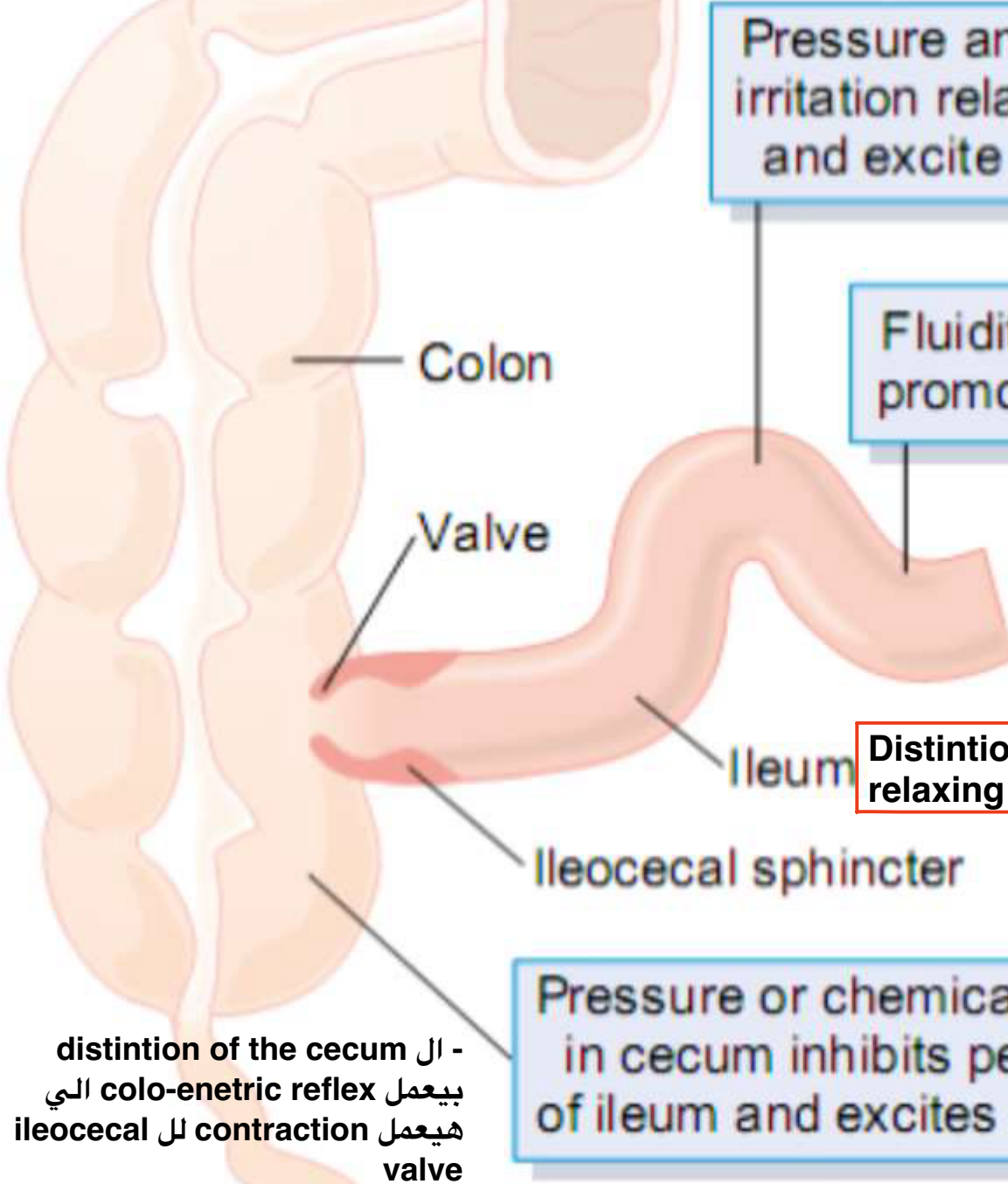
- The *muscularis mucosae* can cause short folds to appear in the intestinal mucosa.
- "Milk" the villi, lymph flows freely from the central lacteals of the villi into the lymphatic system.
 - ال Muscularis mucosa بتعمل milking لل villi عشان ال Fat يروح على ال lymphatic system (زي ما بتعمل milking لل 🐄)
- Function of the Ileocecal Valve: to prevent backflow of fecal contents from the colon
- 1000 milliliters of chyme empty into the cecum each day.
- Feedback Control of the Ileocecal Sphincter
- Reflexes from the cecum(distention& irritation) cont .of sphincter, inhibit peristalsis thus delay emptying.(coloileal reflex).

Movement of Villi by Villikinins

ال vilus يكون فيها 80%، arteriovenous anastomosis من ال blood بوصلش لل Tip
 - لما يصير hypoperfusion بصير blunting والمنطقة الي فوق بتروح (ال Tip)، فهيك بتقل ال surface area for absorption



كمان بصير folding of the vili، في نص ال vili فيه ال central lacteal (عبارة عن وعاء لمفاوي) هاد
 الي ال fat بتروح فيه بعد ما يصير لها milking، فبتمشي فيه لحد ما تصل ال left thoracic duct
 ومنها ع ال blood وبعديها تصل لل liver



The diagram illustrates the anatomical relationship between the ileum, cecum, and colon, and the physiological reflexes that regulate the ileocecal valve. The ileum is shown entering the cecum from the right, with the ileocecal valve and sphincter at the junction. The colon is shown as a large, sac-like structure on the left. Arrows point from text boxes to specific anatomical features: the ileocecal junction, the cecum, and the colon. The text boxes describe the effects of pressure and chemical irritation on the sphincter and peristalsis, the fluidity of contents on emptying, and the inhibition of ileum peristalsis and excitation of the sphincter by pressure or chemical irritation in the cecum.

Pressure and chemical irritation relax sphincter and excite peristalsis

Fluidity of contents promotes emptying

Colon

Valve

Ileum

Distinction of the ileum → relaxing of the ileocecal valve

Ileocecal sphincter

Pressure or chemical irritation in cecum inhibits peristalsis of ileum and excites sphincter

distinction of the cecum - ال
يعمل colo-enetric reflex
يعمل contraction لل ileocecal valve

4-Movements of the Colon

◎ The principal functions of the colon are :

- Absorption of water and electrolytes from the chyme to form solid feces (Proximal1/2).

- Storage of fecal matter until it can be expelled (Distal1/2).

- ^{1.} Mixing Movements-"Haustrations"

- 80 to 200 milliliters of feces are expelled each day.

- ^{2.} Propulsive Movements-"Mass Movements." ^{3.} نوع movment

- Persistent haustral contractions, requiring as many as 8 to 15 hours to move the chyme from the ileocecal valve through the colon. يعني اشي لسنا ماكله، عشان يصير stool بده من 24h ل 36h

- (1-3times daily) After breakfast by one hour.

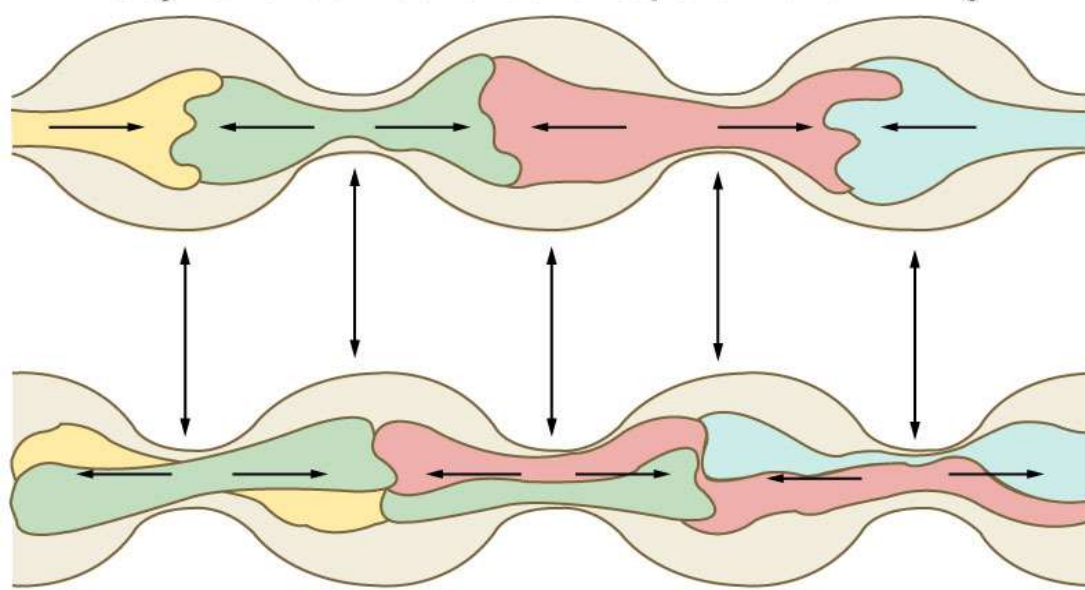
من نص ساعة لساعة

- ال Mass movment الي بعملها stimulation هو وجود food في ال duodenum أو في ال stomach، عشان هيك هي stimulated by ال duodenocolic reflexes وال gastrocolic reflexes

- بتصير مرتين في اليوم، أكثر مرة بتصير الصبح بعد الإفطار وبنسميه gastrocolic reflex وبتحصل مرات في الليل after the dinner

- عشان هيك الي عندهم إمساك بنقلهم لازم ننشط ال gastrocolic reflex عن طريق انه هاد العيان بنقله لازم تفطر كل يوم وبعد الفطور بربع ساعة بنعطيه تحميله وبنقله جرب تروح ع الحمام نعمل training

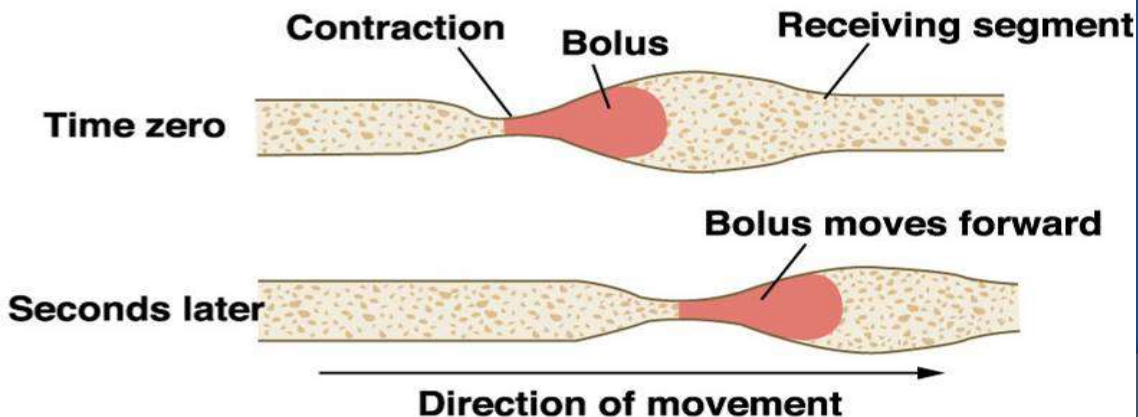
Segmental contractions are responsible for mixing



Large intestinal motility patterns

- Segmental contraction (*Haustration*)

Peristaltic contractions are responsible for forward movement



- Peristalsis

= Segment En Mass

A Mass Movement : is a Modified Type of Peristalsis Characterized by

- First, A constrictive ring occurs in response to a distended or irritated point in the colon, usually in the Transverse colon.
- Then, Rapidly, the 20 or more centimeters of colon *distal to the constrictive ring* lose their Haustrations and contract as a unit, propelling the fecal material in this Segment En Masse further down. مش زي ال peristalsis بتشتغل 5cm 5cm،
لا، هادي مرة وحدة 0.5m of the colon
بفضى
- The contraction develops progressively more force for about 30 seconds, and relaxation occurs during the next 2 to 3 minutes.
- A series of mass movements usually persists for 10 to 30 minutes. Then they cease but return perhaps a half day later.

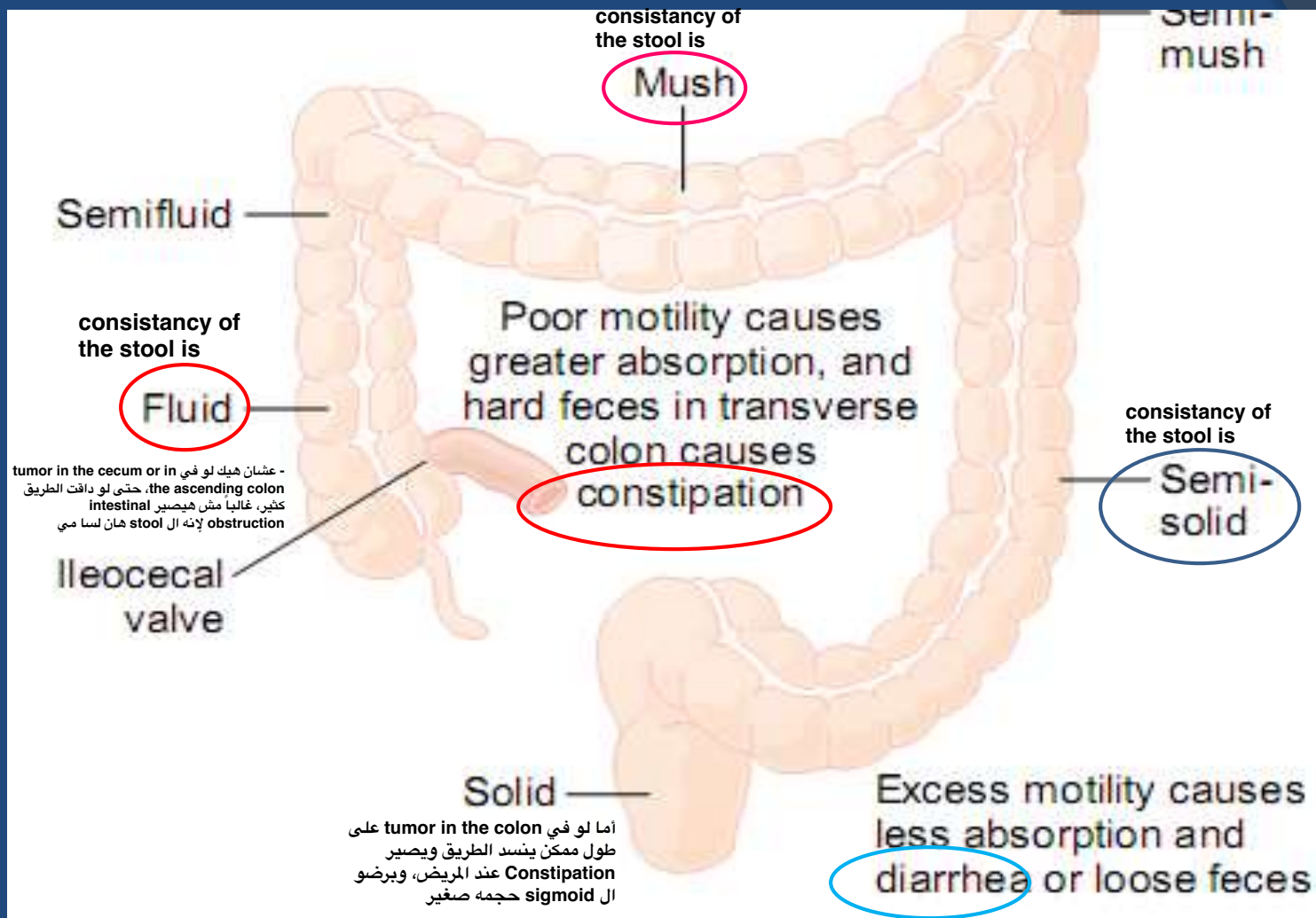


Figure 63-5

● Initiation of Mass Movements by Gastrocolic and Duodenocolic Reflexes.

Appearance of mass movements after meals is facilitated by Gastro Colic and Duodeno Colic reflexes.

These reflexes result from Distention of the stomach and Duodenum.

Irritation in the colon can also initiate intense mass movements.(in *ulcerative colitis* mass movements persist almost all the time).

Defecation

لأنه عننا weak functional sphincter

- Most of the time, the rectum is empty of feces as a result of:

يعني هو physiological sphincter

- Weak functional sphincter exists about 20 cm from the anus at the junction between the sigmoid colon and the rectum.

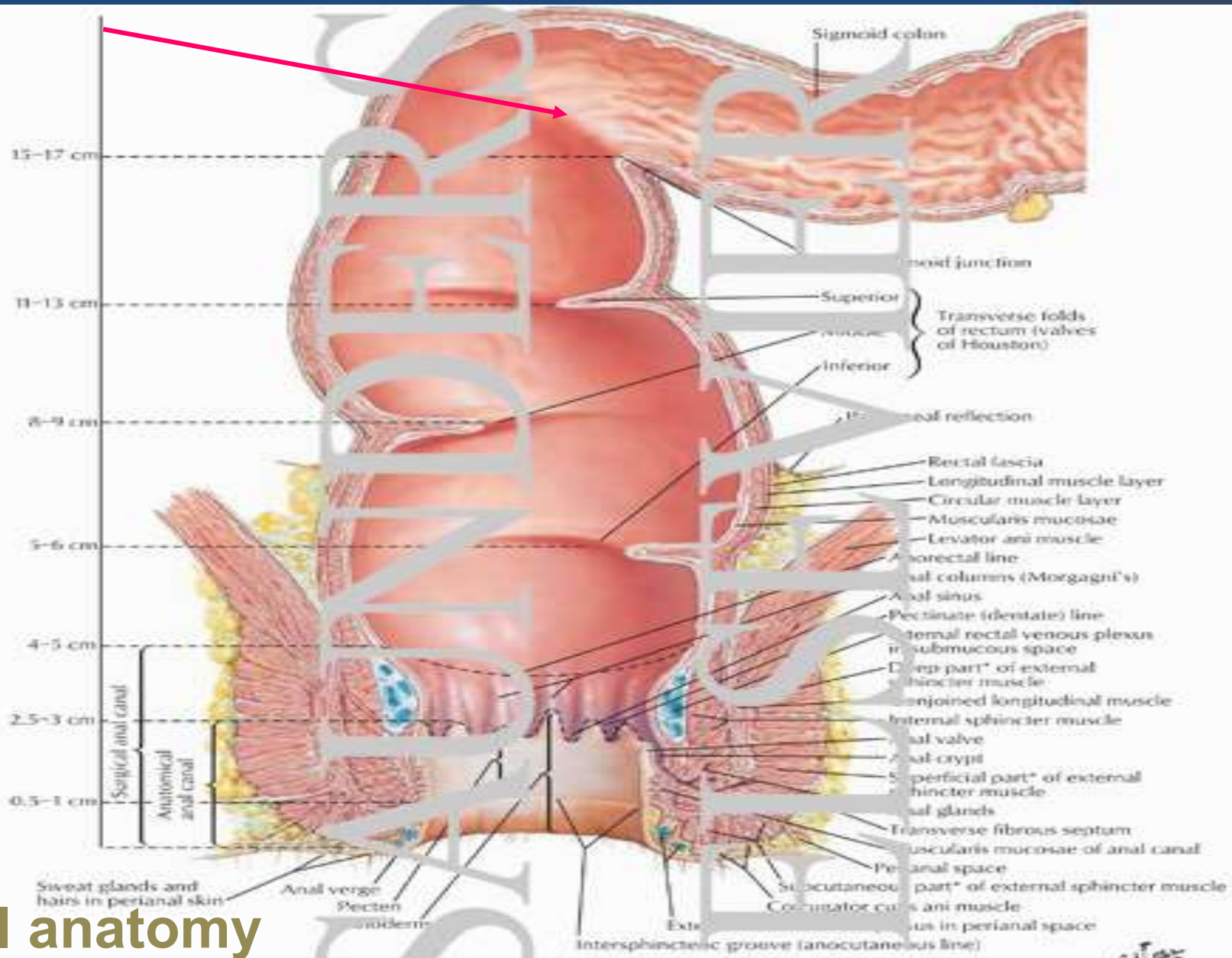
- There is also a Sharp Angulation here that contributes additional resistance to filling of the rectum.

- Defecation Reflexes :

- Intrinsic myenteric reflex: is relatively weak .

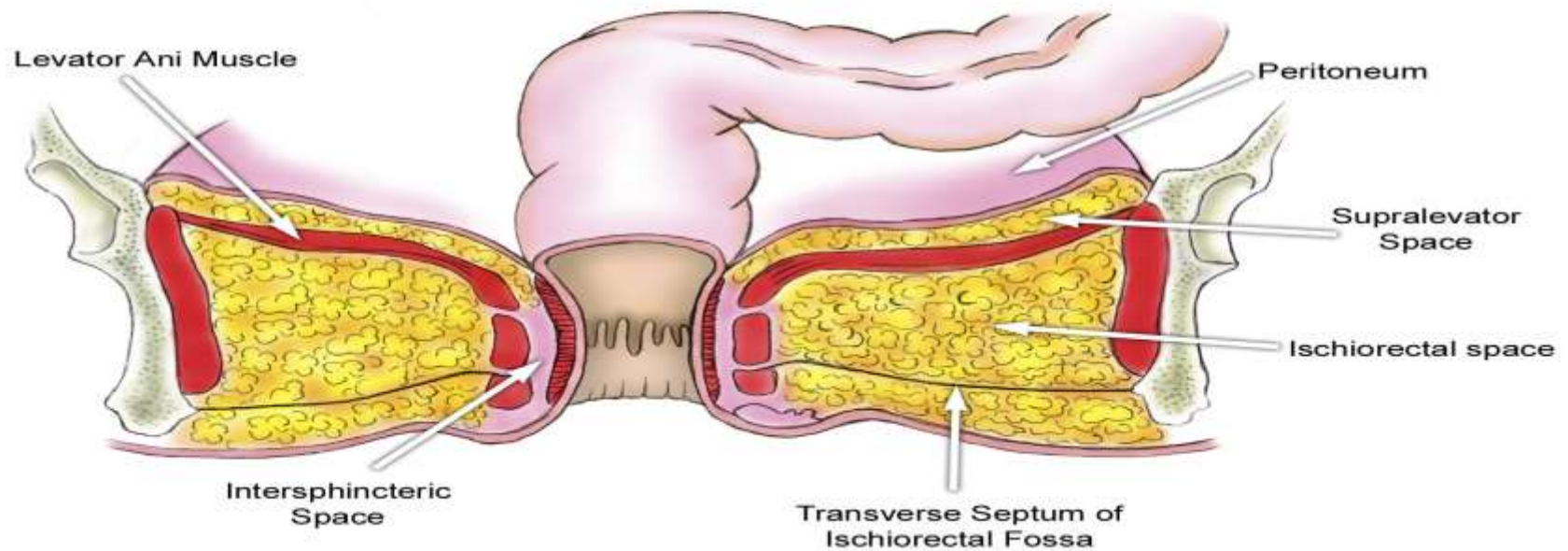
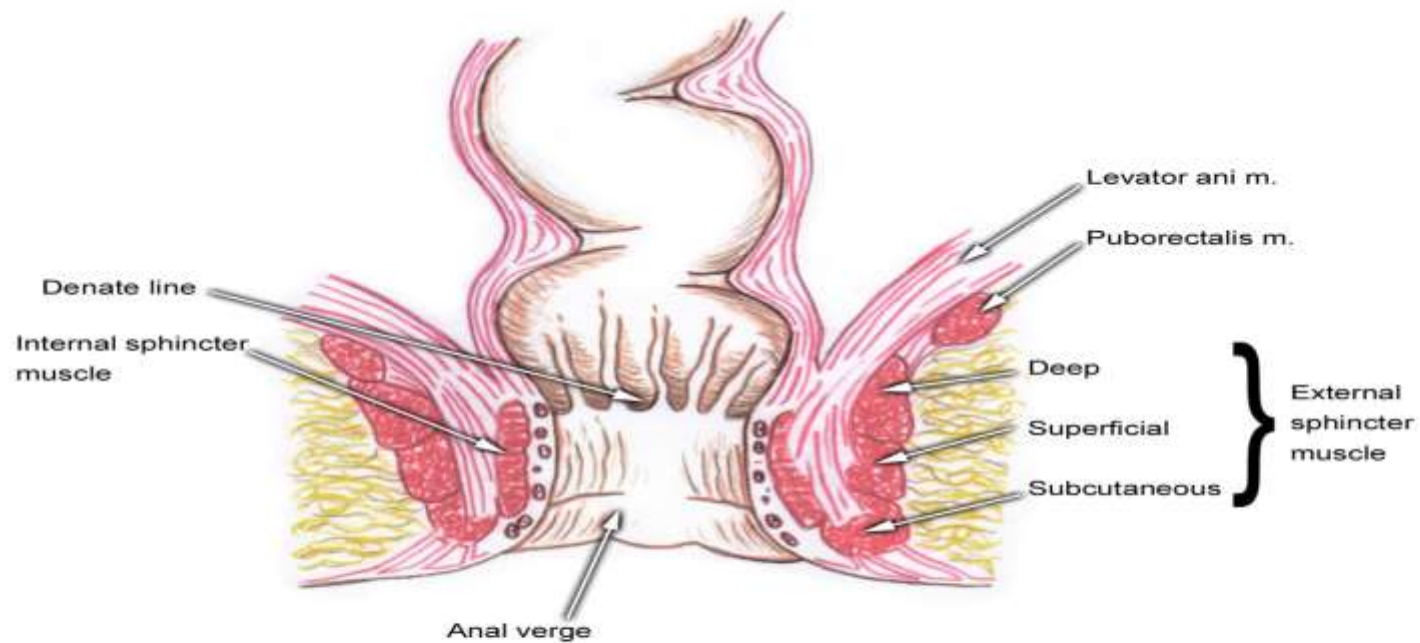
- Parasympathetic Defecation Reflex: powerful process of defecation .

Pelvic splanchnic nerve from S2,3,4



ectal anatomy

*Parts variable and often indistinct



لما ال stool يعدي على ال rectal بصير rectal destention، مش بس انه هيصير
rectal contraction و relaxation لل internal sphincter، برضو بصير شغللات

- ① **Defecation signals** : entering the spinal cord initiate other effects, such as taking a Deep breath, Closure of the glottis, and Contraction of the abdominal wall muscles to force the fecal contents of the colon downward and at the same time cause the pelvic floor to relax downward and pull outward on the anal ring to evaginate the feces.
- ② People who too often inhibit their natural reflexes are likely to become severely constipated.

5-Other Autonomic Reflexes That Affect Bowel Activity

- ⦿ Peritoneo-intestinal reflex. (peritonitis)
- ⦿ Reno-intestinal reflex. Renal stones
- ⦿ Vesicoi-ntestinal reflex. urinary bladder والي عندهم مشكلة كمان في ال
- ⦿ All *Inhibit Intestinal Activity*

كل هداول بعملوا conctipation

