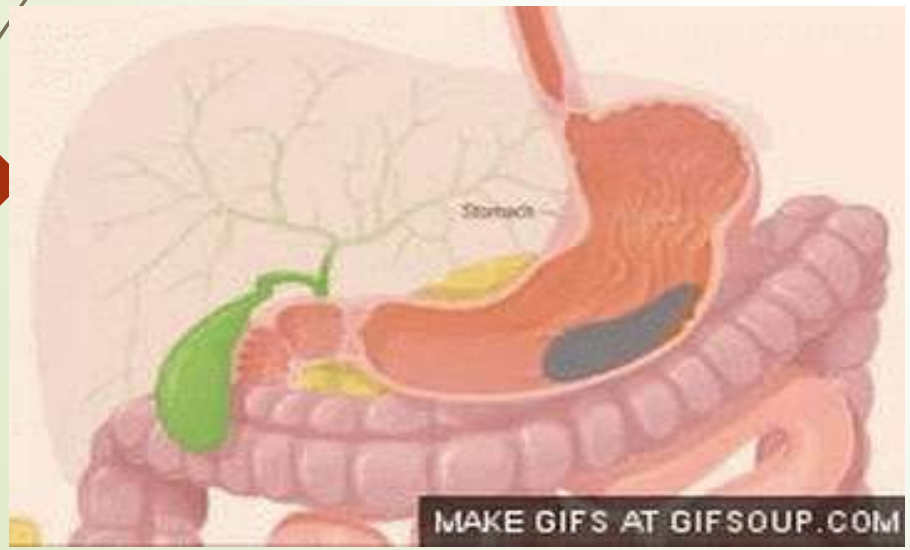
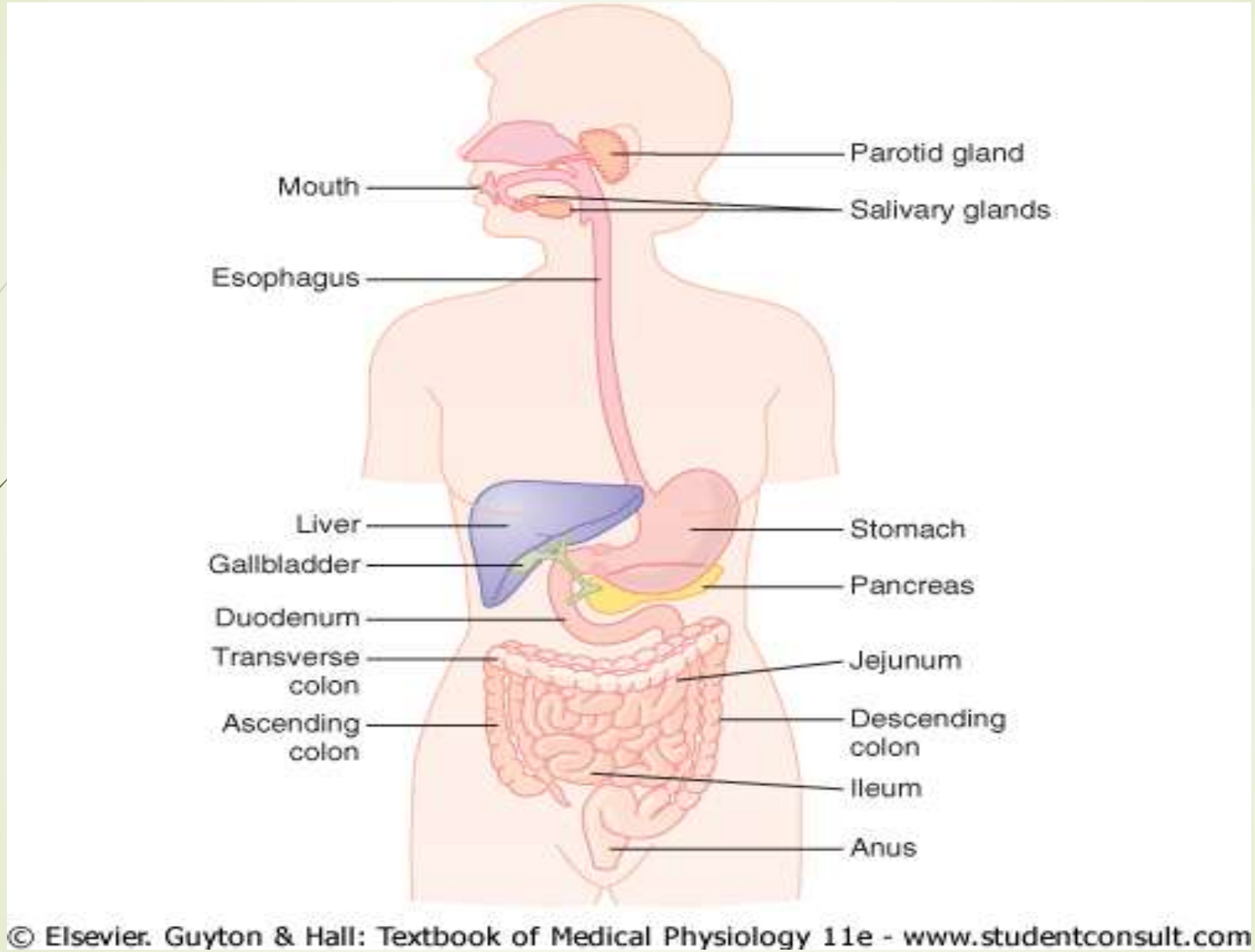
Principles of GI MOTILITY



Dr. Nimty Raina



One of the important function of alimentary tract is movement of food (Motility)

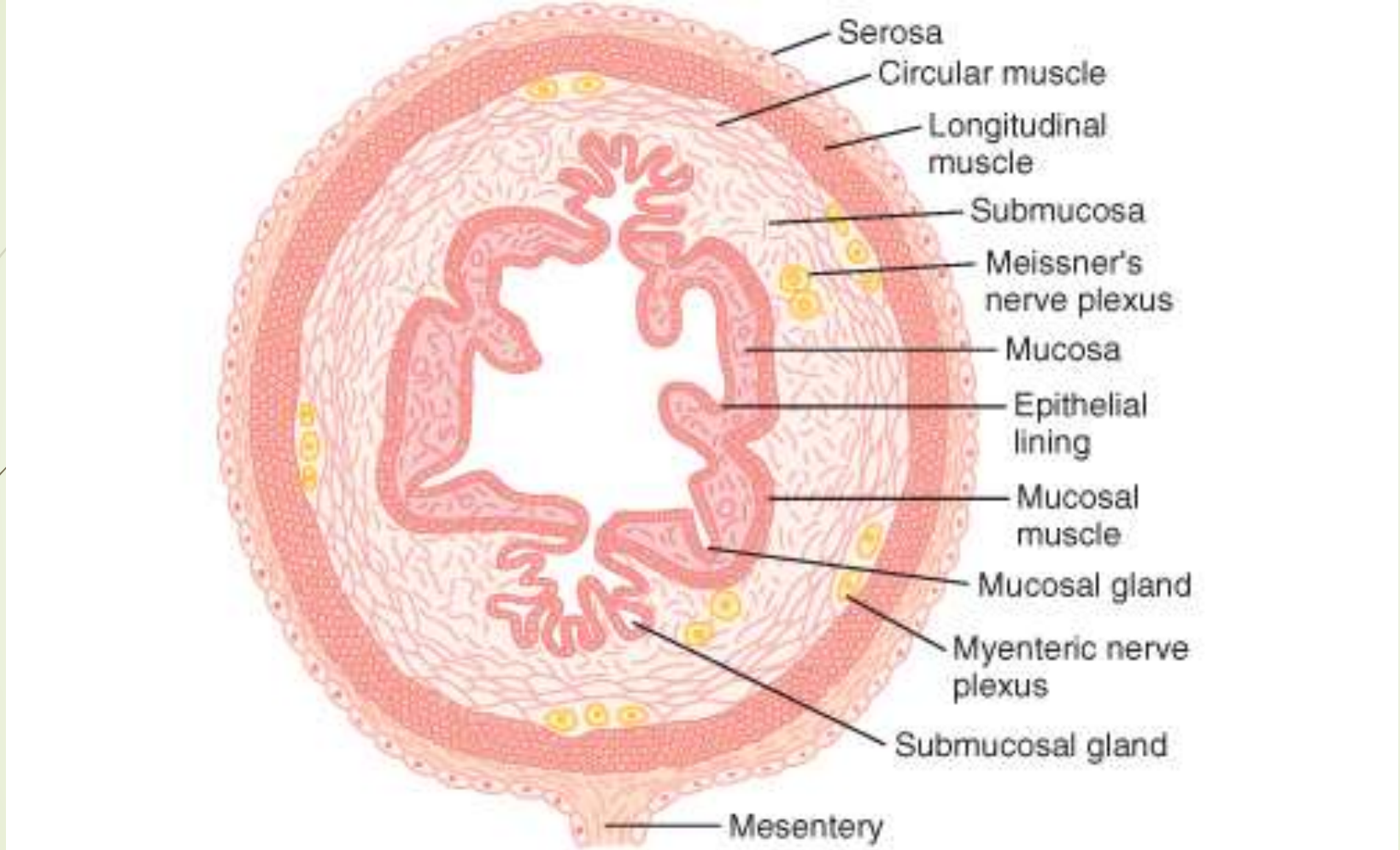
This function is controlled by *LOCAL, HORMONAL & NERVOUS* systems

Physiological Anatomy of Gastrointestinal Wall

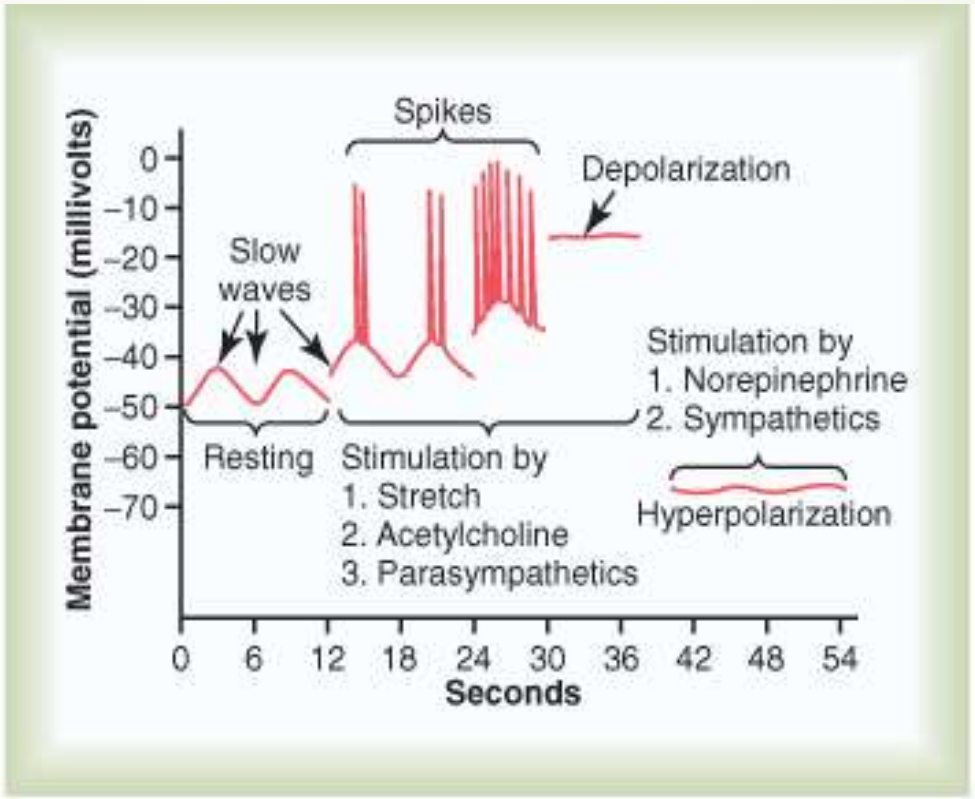
The layers from outer surface to inward:

1. **Serosa**
2. **Longitudinal smooth muscle**
3. **Circular smooth muscle**
4. **Submucosa**
5. **Mucosa**

All these layers perform motor function of GUT



- **SYNCYTIUM-**



Electrical activity of Gastrointestinal Smooth Muscle

There are two basic types of electrical waves:

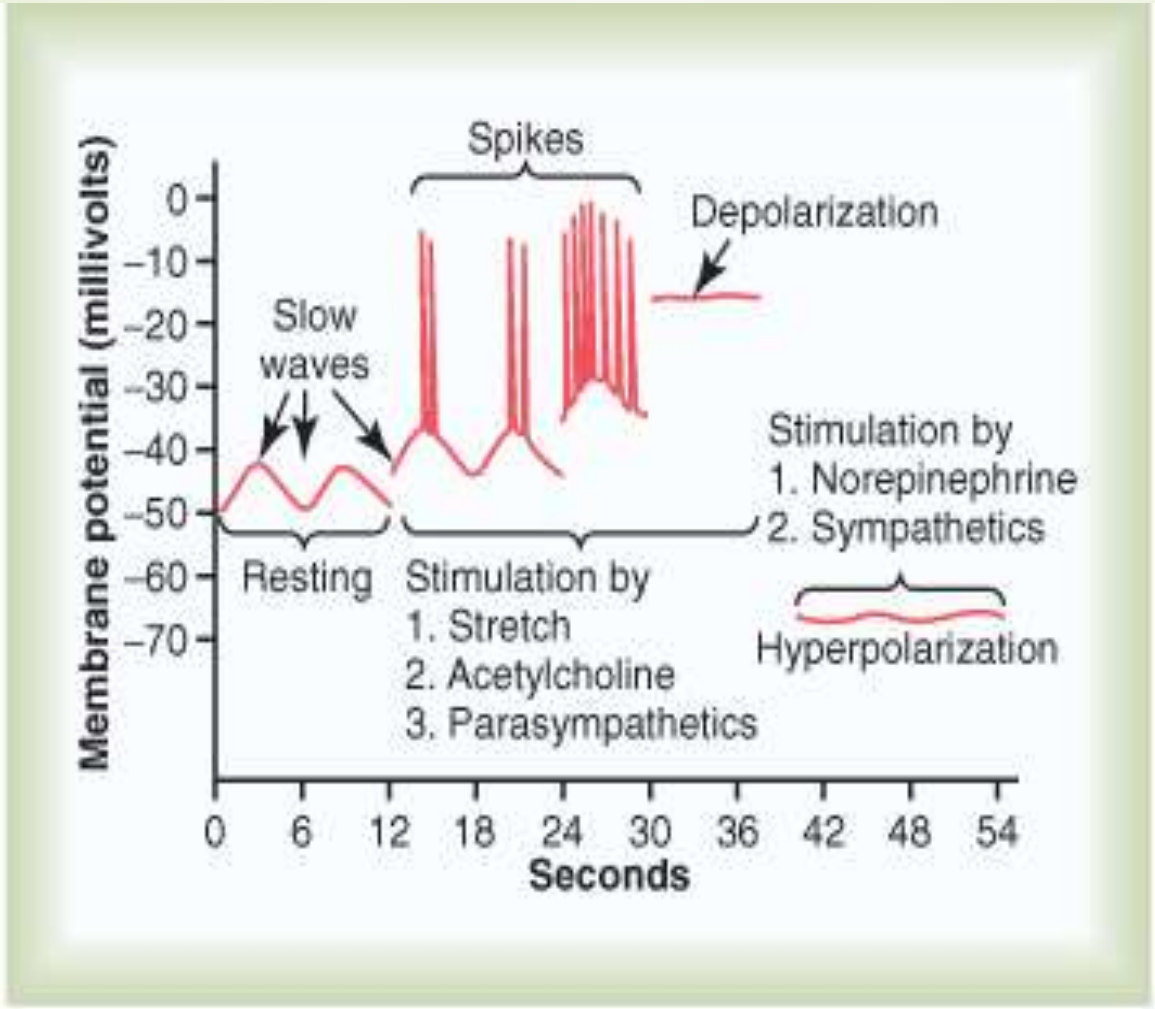
A. Slow wave

B. Spikes

SLOW WAVES

Caused by undulating changes in Resting Membrane Potential

Interaction of smooth muscle cell & specialized cell- *INTERSTITIAL CELLS OF CAJAL* (electrical pacemakers for smooth muscle)



SPIKE POTENTIAL

True Action Potential

Occurs automatically when resting membrane potential of gastrointestinal smooth muscle becomes -40 mv.

Cause is opening of CALCIUM-SODIUM CHANNELS

The ENTERIC NERVOUS SYSTEM

Lies entirely in the wall of GUT (esophagus to anus)

A. Outer plexus- lies between longitudinal & circular muscle *layers-MYENTERIC OR AUERBACH'S PLEXUS*

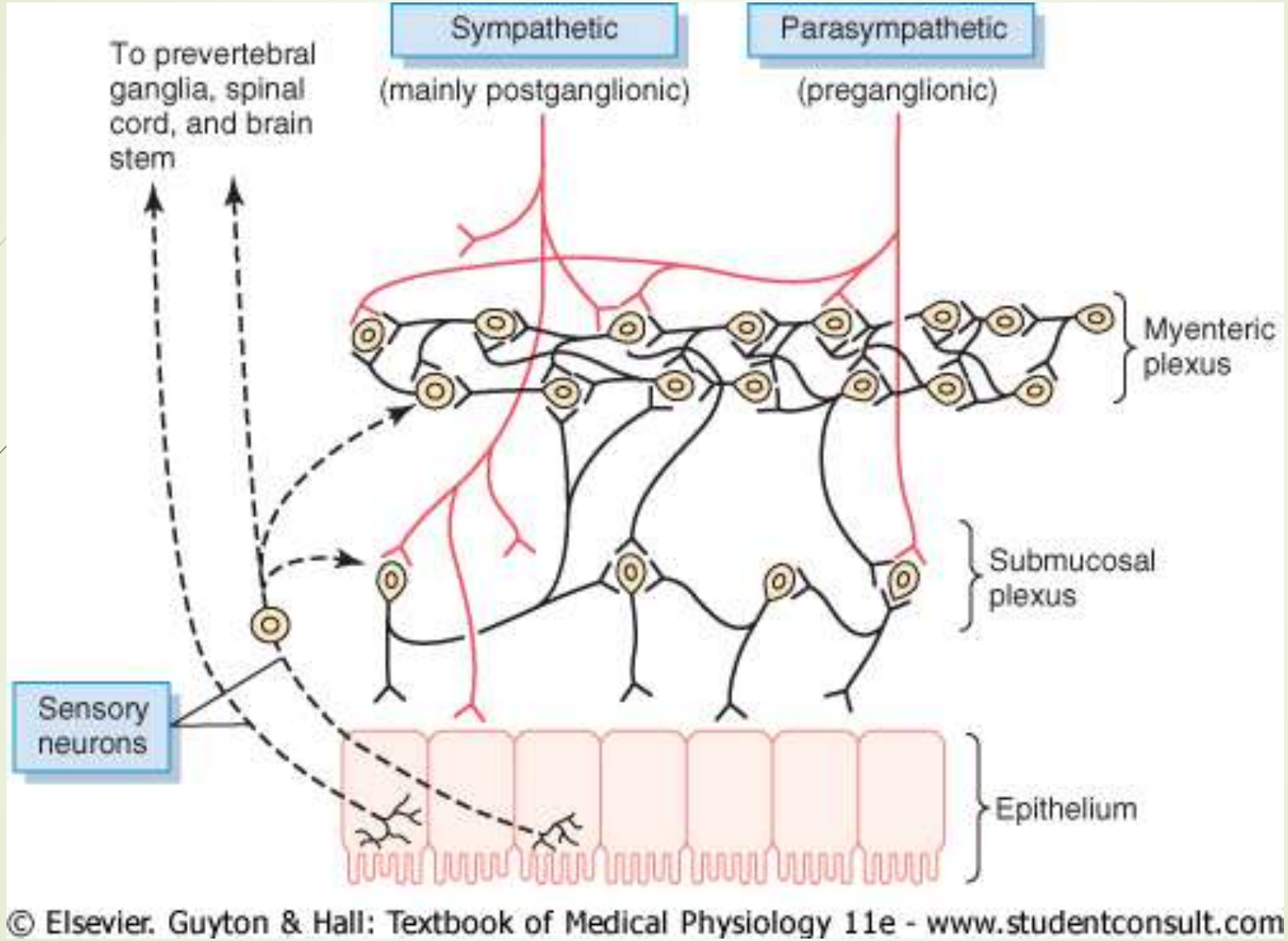
B. Inner plexus- lies in the submucosa- *SUBMUCOSAL PLEXUS OR MEISSNER'S PLEXUS*

Stimulatory effect of myenteric plexus- increased tone, rhythmic contraction, increased rate of rhythmic contraction, increased velocity of conduction

Inhibitory effect of myenteric plexus-

Pyloric sphincter & ileocecal valve

Submucosal plexus- functions are secretion, absorption, local contractions of the submucosal muscle


Sympathetic
(mainly postganglionic)
Parasympathetic
(preganglionic)
To prevertebral ganglia, spinal cord, and brain stem
Myenteric plexus
Submucosal plexus
Sensory neurons
Epithelium
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Autonomic control of GI tract

Parasympathetic stimulation increases the enteric nervous system activity (SACRAL & CRANIAL division)

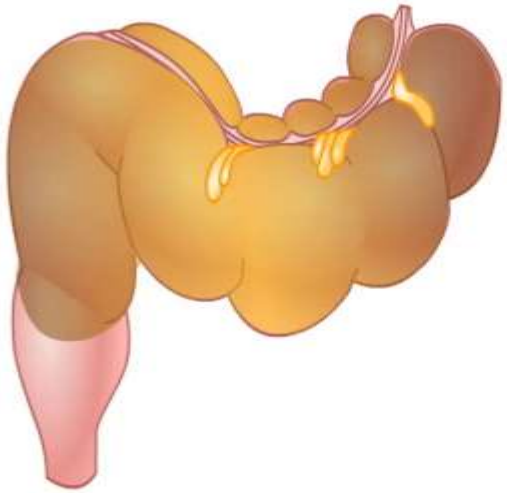
Sympathetic stimulation usually inhibits GI tract activity (T5-L2 segment)

GASTROINTESTINAL REFLEXES

1. Reflexes integrated entirely within the gut

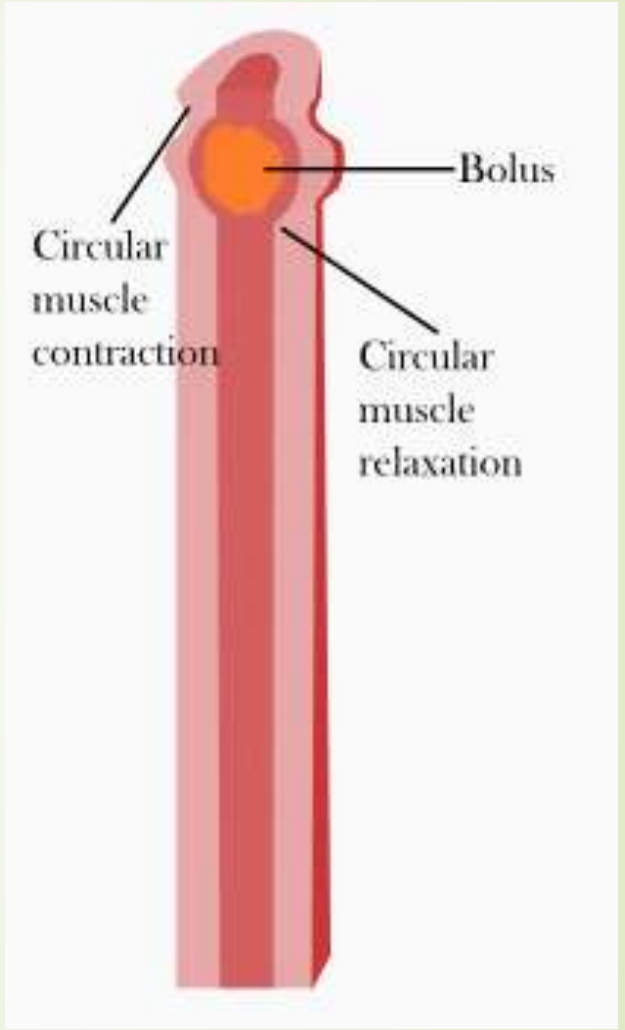
2. Reflexes from GUT –prevertebral sympathetic ganglia-back to GI tract- (gastrocolic reflexes, enterogastric reflexes, colonoileal reflexes)

3. Reflexes from GUT to spinal cord or brainstem-back to GI tract- (defecation reflex, pain reflexes)



Gastrocolic reflex and mass peristalsis

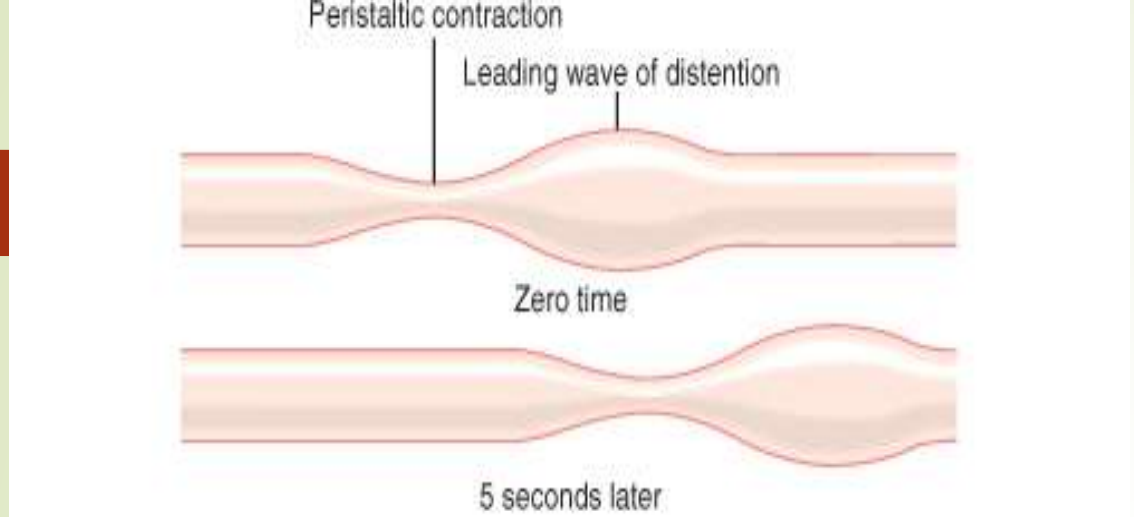
- The gastrocolic reflex is also triggered when food enters and distends the stomach.
- This reflex intensifies strong mass peristalsis movements that force feces into the rectum.

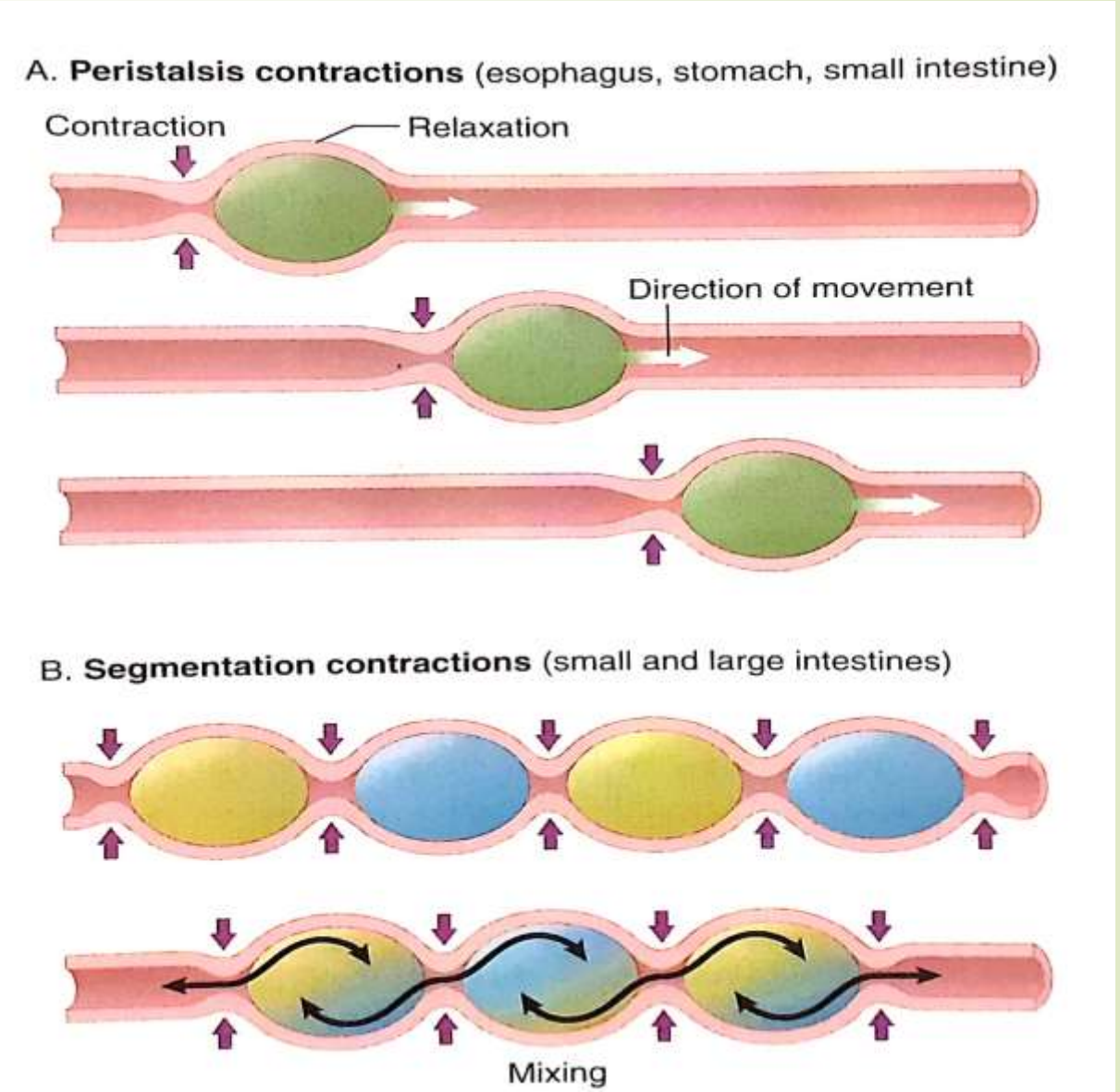


Functional Movements of GI Tract

1. Propulsive movements- (causes food to move forward)

2. Mixing movements- (segmentation contraction)





"LAW OF GUT"

As the myenteric plexus is polarized in anal direction- the food is pushed in anal direction

Myenteric reflex or peristaltic reflex + anal direction of movement of peristalsis = "LAW OF GUT"

GI BLOOD FLOW

- ***Splanchnic circulation-***

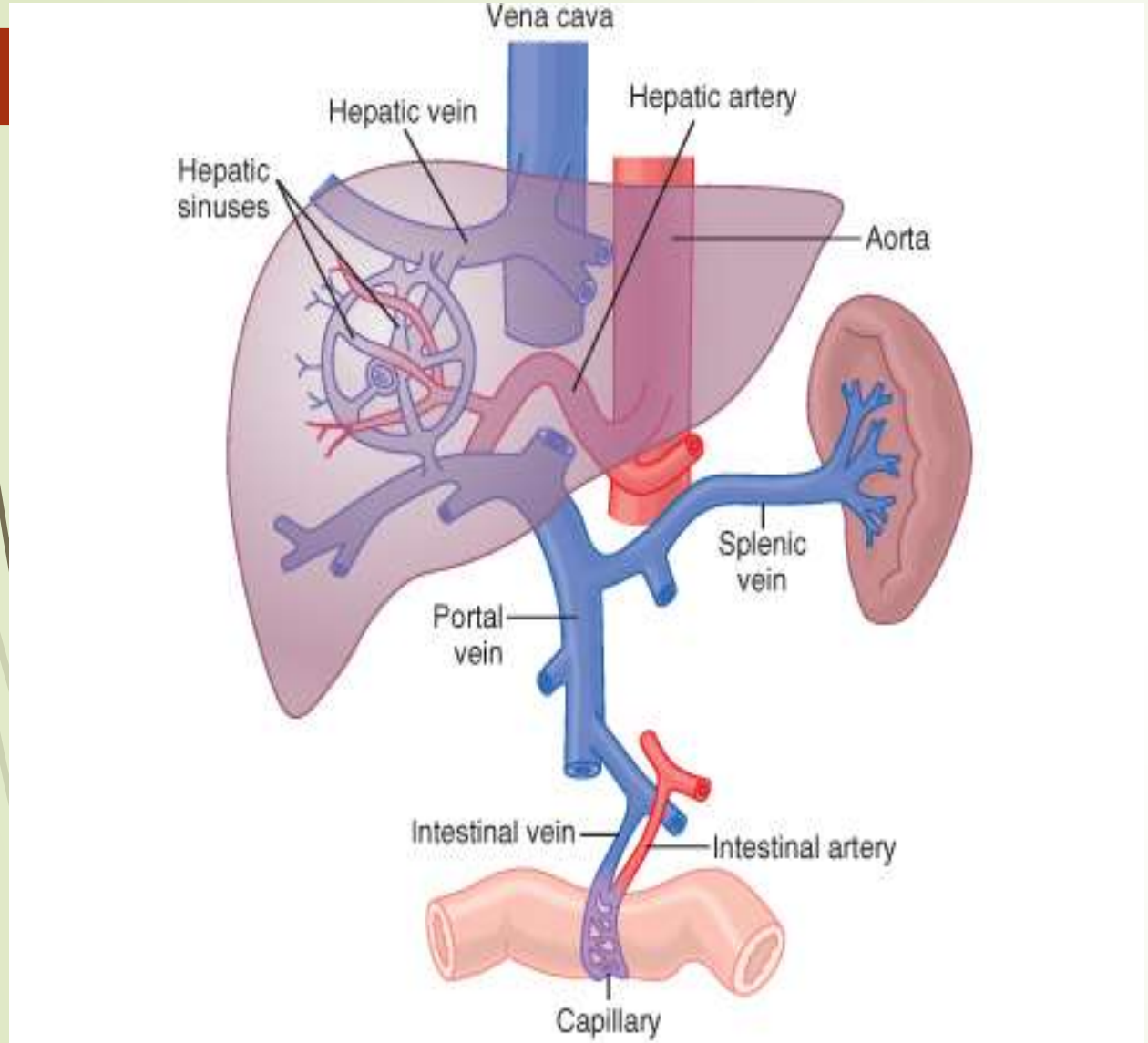
Increased blood flow is due to :

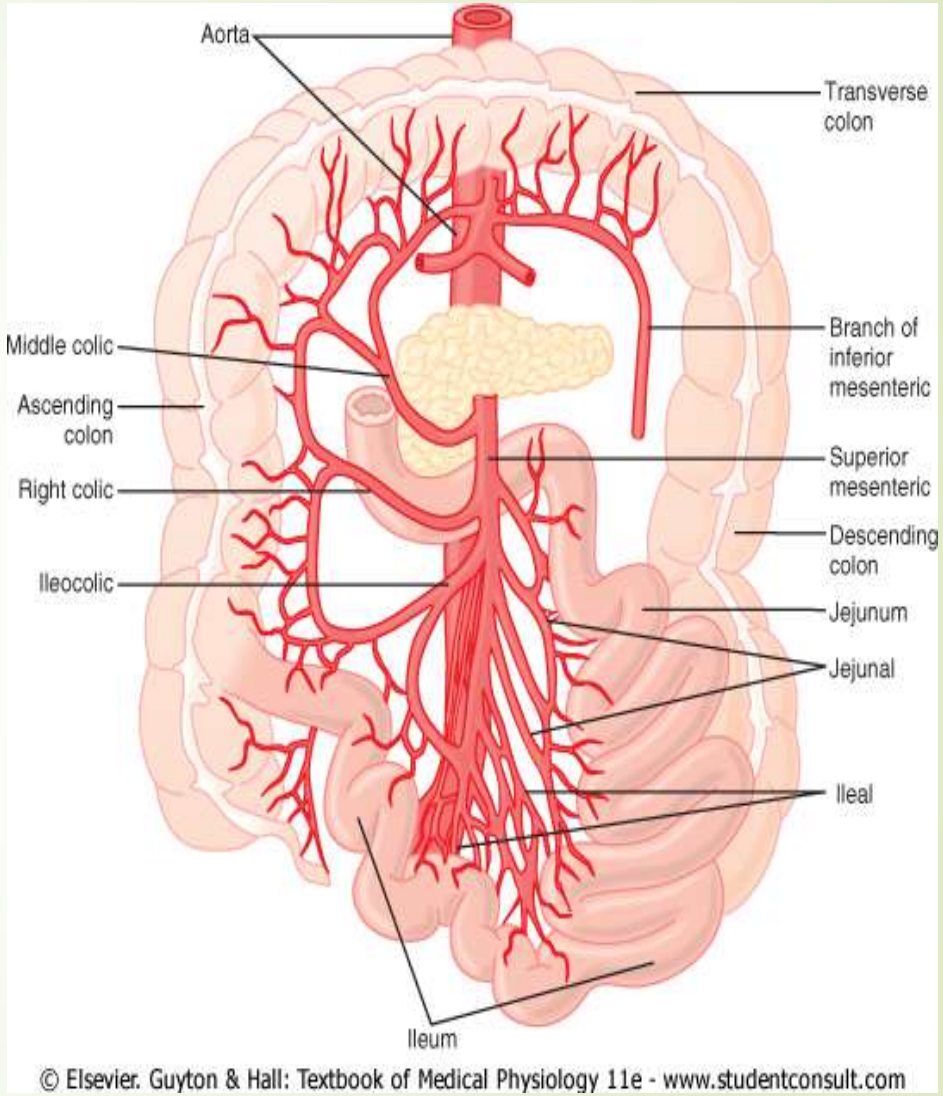
1. Release of vasodilators

2. Peptide hormones

3. Release of kinins

4. Decreased oxygen concentration in gut wall (adenosine release)





Control of GI Blood flow

1. Parasympathetics increases blood flow

2. Sympathetics decrease the blood flow

Phenomenon of "AUTOREGULATORY ESCAPE"