physiology GIT))

المحاضرة الأولى

المرحلة الثانية

**Physiology of gastrointestinal tract (GIT)**

The gastrointestinal tract is a continuous tube that stretches from the mouth to anus .its primary function is to serve as a portal whereby nutrients , vitamins minerals ,water and electrolyte can be absorbed into the body .

The major activities of GIT:

**1**- Ingested food .

**2**- The meal is mixed with Secretion from gastrointestinal tract itself and organs that drain into it such as salivary gland, pancreas and gall- bladder

**3**-. A variety motility patterns that serve to mix the meal with digestive secretions and move it along the length of GIT.

**4-** Digested food in which proteins , fats and complex carbohydrates are broken down into absorbable units.

**5**-Absorption of nutrients, electrolytes and water from the intestinal lumen to blood stream.

6-The residues of the meal that cannot be absorbed are expelled from the body.

**7**-GIT have regulatory mechanisms act both locally and systematically.

**8**-GIT have large number of bacteria particularly in the colon or large intestine .

**Electrical Activity of Gastrointestinal**

**Smooth Muscle**

The smooth muscle of the gastrointestinal tract is excited by almost continual slow, intrinsic electrical activity along the membranes of the muscle fibers. This activity has two basic types of electrical waves

(1)*slow waves* and (2*) spikes*, the voltage of the resting membrane potential change to different levels, this have important effects in controlling motor activity of the gastrointestinal tract.

***Slow Waves***. Most gastrointestinal contractions occur rhythmically, by the frequency of “slow waves” of smooth muscle membrane potential. These waves, not action potentials, they are slow , undulating changes in the resting membrane potential .Their intensity usually varies between 5 and15 millivolts , and their frequency ranges in different parts of the human gastrointestinal tract from 3 to 12per minute about 3 in the body of the stomach, as much as 12 in the duodenum, and about 8 or 9 in the terminal ileum. .

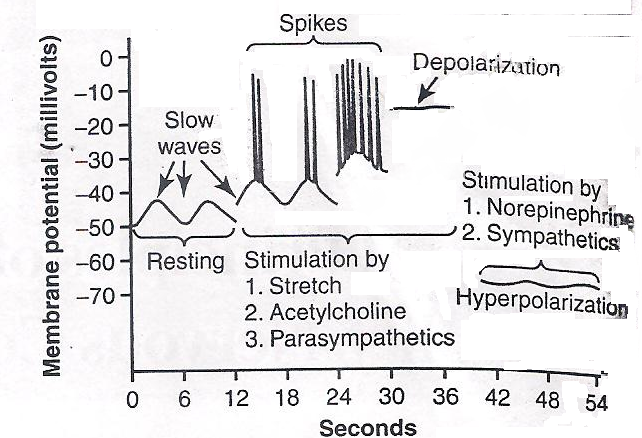
slow waves is appear to be caused by complex interactions among the smooth muscle cells and specialized cells, called the interstitial cells of Cajal, act as electrical pacemakers for smooth muscle cells. These interstitial cells form network with each other and are interposed betwe en the smooth muscle layers, with synaptic-like contacts to smooth muscle cells. The interstitial cells of Cajal undergo cyclic changes in membrane potential due to unique ion channels that periodically open and produce inward (pacemaker) currents that may generate slow wave activity.

***Spike Potentials***.

The spike potentials are true action potentials. They occur automatically when the resting membrane potential of the gastrointestinal smooth muscle becomes more positive than about -40 millivolts. in Figure( 2) each time the peaks of the slow waves temporarily become more positive than -40 millivolts, spike potentials appear on these peaks. The higher the slow wave potential rises ,the greater the frequency of the spike potentials ,usually ranging between 1 and 10 spikes per second, each gastrointestinal spike lasting as long as 10 to 20 milliseconds.

potential averages about -56 millivolts, but multiple factors can change this level. When the potential becomes less negative which is called *depolarization* of the membrane, the muscle fibers become more excitable.When the potential

becomes more negative, which is called *hyperpolarization,* the fibers become less excitable. Factors that depolarize the membrane—that is, make it more excitable—are *(1) stretching of the muscle*, *(2) stimulation by acetylcholine*, *(3) stimulation by parasympathetic* nerves that secrete acetylcholine at their endings, *and (4) stimulation by several specific gastrointestinal hormones*. Important factors that make the membrane potential more negative—that is, hyperpolarize the membrane and make the muscle fibers less excitable—are(1) the effect of *norepinephrine or epinephrine* on the fiber membrane and (2) stimulation of the sympathetic nerves that secrete mainly *norepinephrine* at their endings.

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**Figure**. membrane potentials in intestinal smooth muscle. Note the slow waves , the spike potentials, total depolarization, and hyperpolarization all of which occur under different physiologic conditions of the intestine