

GIT electrical manifestations

GIT smooth muscle cells are connected to each other via gap junctions, allowing easy movement of ions between cells. Therefore, the electrical stimuli inducing contraction easily pass from one cell to another. They thus form a functional syncytium. Several junctions also exist between the circular and longitudinal layers.

Types of electrical activity

1. **Slow waves** indicate the basic rhythm (BER, Basic Electrical Rhythm) of bowel movements. However, these are not action potentials, but regular changes in the resting membrane potential. The frequency is about 8-12 per minute depending on the location. They arise due to *interstitial cells of Cajal* (read Kachal) that function as electrical pacemakers (periodic opening and closing of ion channels). These waves do not cause muscle contraction by themselves.
2. **Spike potentials** are true action potentials. They occur when the membrane potential exceeds the threshold value, i.e. when slow waves temporarily reach the threshold potential. Unlike nerves, where Na^+ plays the biggest role in the formation of the action potential, Ca^{2+} is particularly involved here. An increased concentration of Ca^{2+} in the cell initiates contraction.

Factors affecting electrical activity

The value of the resting membrane potential can be affected in both directions by several factors:

depolarizing (ie excitatory)	hyperpolarizing (ie dampening)
parasympathetic	sympathetic
acetylcholine	norepinephrine nebo adrenaline
muscle stretch	
some effects of GIT	

Bowel movements

Bowel movements can be divided into **mixing contractions** and **driving contractions**. This division is not strict, as the functions of both types overlap. The **myenteric plexus** plays an important role in them. Although the **enteric nervous system** can function independently, the sympathetic (generally suppresses digestion) and **parasympathetic** (generally promotes digestion) nerves significantly influence its function.

Small intestine

1. When part of the intestine is distended by chyme, the intestinal wall responds by contracting. These take place in several places of the intestine at the same time. Digestion is "chopped" (2-3x per minute) to gradually mix chyme with intestinal secretions (**segmentation** and **rocking movements**).
2. Chymus is propelled through the intestine by **peristaltic waves**. These move in the aboral direction at a speed of about 0.5-2 cm/s and usually subside after 3-5 cm, the movement of chyme is about 1 cm/min (ie, from the pylorus to the ileocecal valve it arrives in 3 to 5 hours). Peristalsis of the small intestine increases after a meal as a result of the gastroenteric reflex (caused by distension of the stomach and the wall of the duodenum). Intestinal motility is increased by gastrin, cholecystokinin (CCK), insulin (we are full, the contents of the intestine can easily leave), motilin and serotonin; it is inhibited by secretin and glucagon

(nutrients are missing, it is necessary to squeeze out as much as possible from the food, so it has to stay there for a while). Peristaltic waves not only move the digestate into the caeca, but also spread it along the mucosa. At the level of the ileocecal opening, the movement of the intestinal contents usually stops for several hours (until the person eats *gastroileal reflex*).

Peristaltic impulses are non-physiological intense peristaltic waves that can occur with some infections or obstructions - the intestine is trying to get rid of the irritating contents. Sometimes there can also be a reversal of peristalsis. Movements also take place in the villi: the contraction shortens the villi, thereby pushing out the lymph. Peristalsis is significantly reduced when atropine is administered - it has an anticholinergic effect (competitive antagonist of acetylcholine). At high doses, the intestinal passage may stop!

Colon

1. During mixing contractions, the muscles of the large intestine contract similarly to those of the small intestine. Together with the tension of the taenia, typical haustrations arise. Each contraction lasts about 60 seconds, at the same time there is a shift in the aboral direction. After a few minutes, more contractions appear in the adjacent area. In this way, the intestinal contents are gradually exposed to the mucous membrane and massive absorption occurs.
2. **Propulsive movements** occur one to three times a day (after meals) that move large amounts of colon

contents. It is a modified type of peristalsis, when a contractile ring is formed as a reaction to irritation of the colon (usually colon transversum); then the haustration disappears for the next 20 cm, the entire section contracts and the contents move further. The entire process takes 2-3 minutes and is repeated several times within 30 minutes. Propulsive movements are mostly initiated by the *gastrocolic* and *duodenocolic reflexes*, which are the result of distension of the stomach and duodenum; however, they can also be caused by irritation of the colon.

Links

Related articles

- Enteric autonomic system

References

- GUYTON, Arthur C - HALL, John E. *Textbook of Medical Physiology*. 11. edition. Elsevier, 2006. pp. 771-777, 780-790. ISBN 978-0-7216-0240-0.