

THE ROLE OF GASTRINE AND ACETYLCHOLINE IN THE GASTRIC ACID SECRETION MECHANISM

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Abstract

Gastrine is the only peptide hormone released from the stomach which mediates gastric acid secretion, with a well established physiological significance. However, contributing to acid secretion stimulated by food depends on the mechanisms gastrinice, histamine and cholinergic not lost well quantified.

The first indications of positive action of gastrine on parietal cells have been described by Soumarmon (1977), and the first demonstration of the direct effect of gastrine on the parietal cell receptor was done by Soll. It was recently revealed a gastrinic receptor on canine parietal cells, the receptor was cloned and its structure was determined. Other studies have shown that gastrine has a direct action on parietal cells isolated from pig and that in a histamin depended way, gastrine is the main mediator of gastric acid secretion. Acetylcholine is a synaptic transmitter in the central nervous system, the autonomic and ganglionic synapses, neuromedulosuprarenal glands, at all terminal parasymphetic synapses and some sympathetic terminal synapses, and motor terminal plate synapses.

Key words: gastrine, acetylcholine, acid secretion

1. GASTRINE.

Gastrine is a heterogeneous gastrointestinal hormone, part of the linear peptides class without disulfide links.

Cells producing gastrine are called G cells.

These cells are part of the so-called APUD system which consists of a series of cells with endocrine properties, histochemical and morphological, diffuse spread along the upper digestive tract, their name deriving from the common property to retrieve and metabolize amino precursors. They are present in the region of antrum, pylor and proximal duodenum. As shape, G cells are flat cells, have a narrow neck extending to the mucosal surface. The mucous surface of gastrinic cells has microvili containing receptors required for stimulation or inhibition produced by intragastric content. Largest quantity of gastrine in humans is found in antrum and pylor and is represented by the G-17, but G-34 and also other molecular forms of gastrine is only 10% of antral gastrine. In humans, after antrectomy and gastroduodenostomy increasing of seric gastrine level, as a response to food stimulation, is as great as before the exclusion of antrum. Gastrine release is linked to activation of various chemicals on cells G. These substances are released either from blood or from other nerve endings or from stomach contents, which bathe the G cells microvili. Blood

stimulation of G cells is made through the levels of calcium and epinephrine.

Vagal stimulation by false feeding, by direct action or by hypoglycemia, stimulates gastric secretion both by direct action on parietal cells and by release of gastrin from G cells. Vagotomy abolishes this response, and atropine blocked it.

Adjust of gastrin release occurs with a simple negative feedback, respectively gastrin increase the amount of acid and acid directly inhibits the production of gastrin.

2. ROLE OF GASTRIN IN ACID GASTRIC SECRETION.

Gastrin is the only peptide hormone released from the stomach which mediates gastric acid secretion, with a well established physiological significance. However, contributing to acid secretion stimulated by food depends on the mechanisms gastrin, histamine and cholinergic not lost well quantified.

The first indications of positive action of gastrin on parietal cells have been described by Soumarmon (1977), and the first demonstration of the direct effect of gastrin on the parietal cell receptor was done by Soll. It was recently revealed a gastrin receptor on canine parietal cells, the receptor was cloned and its structure was determined.

Other studies have shown that gastrin has a direct action on parietal cells isolated from pig and that in a histamine depended way, gastrin is the main mediator of gastric acid secretion.

Thus gastrin stimulates proliferation of neuroendocrine cells liberating histamine, and an increased density of these cells may explain, at least in part, the increase of gastric secretion in patients with duodenal ulcer and Zollinger-Ellison syndrome. Prolonged and deep hypergastrinemia may lead to gastric carcinomas with departure point from NEC.

Gastrin stimulates the synthesis of histamine from NEC, it having a receptor for gastrin. Some authors consider that because NEC has gastrin receptors, from functional point of view is no longer necessary to keep a gastrin receptor on the parietal cell.

It is suggesting that histamine release through gastrin is not mediated by cyclic AMP. Thus, gastrin increases intracellular calcium in gastric glands and gastric mucosa cells, increasing phosphoinositide turnover in gastric mucosa, layout compatible with the membrane phospholipase C activation. Gastrin therefore acts through histamine. It would have receptors on NEC to stimulate synthesis of histamine by histidine decarboxylase action. Gastrin is considered an important trophic hormone for the production of stomach acid: it increases the weight and thickness of the lining oxyntic,

and, on the other hand, removal of endogenous gastrin has opposite effects.

3. ACETYLCHOLINE.

Acetylcholine is a synaptic transmitter in the central nervous system, the autonomic and ganglionic synapses, neuromedulosuprarenal glands, at all terminal parasympathetic synapses and some sympathetic terminal synapses, and motor terminal plate synapses.

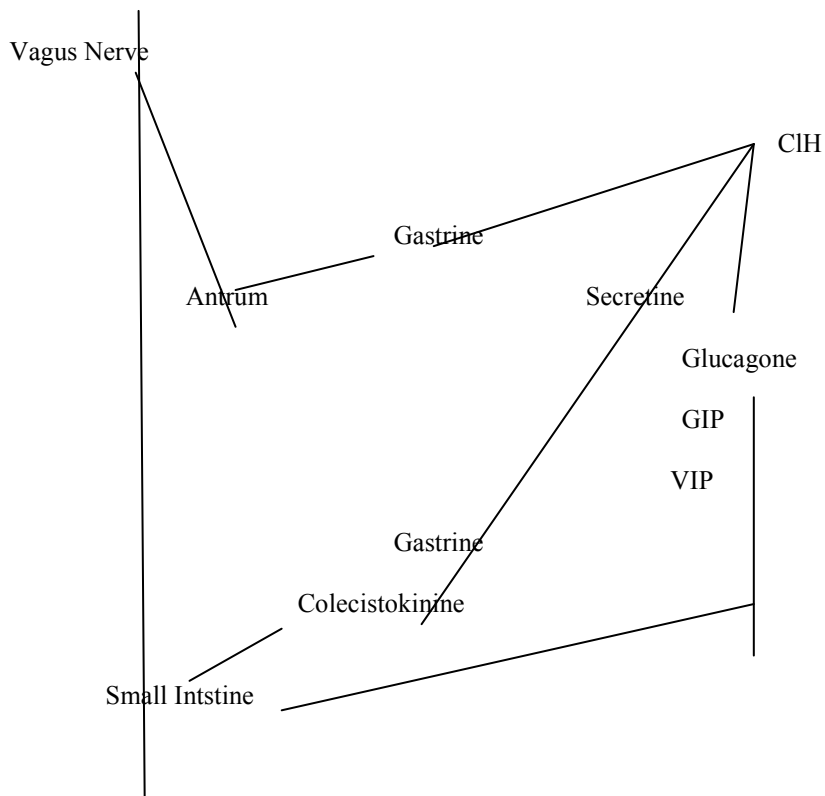
Acetylcholine is synthesized in the cytoplasm of cholinergic neurons from choline and active acetate. Storage of acetylcholine is in synaptic vesicles together with ATP, probably using an active transporter mechanism represented by an ATP-ase Mg-dependent. Acetylcholine release is by exocytosis of the synaptic vesicles. Enabling of the release is due to inflow of calcium ions, which occurs due to slow channel opening of presynaptic membranes, commanded by depolarisation. Calcium ions, together with calmodulina, stimulates synaptic vesicles exocytosis through a mechanism incomplete known.

Acetylcholine is fixed to specific macromolecules - cholinergic receptors - from the postsynaptic membrane. Acetylcholine molecule comprise a cationic end, which penetrates into a place of anion active receiving surface and an ester group, which is fixed to a esterophil seat of this surface. There are two types of cholinergic receptors: muscarinic (M) and nicotinic (N). Have been described 5 muscarinic receptors subtypes M1-M5 and 2 subtypes of nicotinic receptors Nm and Nn. The action of cholinergic receptors cause muscarinic and nicotinic effects such as stimulation of gastrointestinal smooth muscle, bronchoconstriction, heart depression, vasodilatation, increase of glandular secretions (gastric, salivary, sweat, etc..).

4. THE ROLE OF ACETYLCHOLINE IN GASTRIC ACID SECRETION.

The cephalic phase, the gastric secretion is produced by stimuli that arise in the brain and reach the stomach through vagus nerve and cholinergic receptors. Vagal stimulation can be done by false nutrition by insulin hypoglycaemia, administration of 2-oxy-D-glucose or electrical stimulation of vagus nerve. 2-oxy-D-glucose and insulin hypoglycaemia activates the vagus nerve by stimulating a specific area of lateral hypothalamus, because the direct injection into that area of these agents increase gastric secretion. Acetylcholine chemical mediates the vagus nerve impulses and m-choline can replace vagus nerve on nerveless samples, but the parietal cell receptors for acetylcholine are no nicotinic and muscarinic receptors. Resuming, the interaction between the nervous and the hormonal

stimulation of gastric acid secretion of gastric cell can be represented as follows:



5. CONCLUSIONS.

1. Gastrine is a heterogeneous gastrointestinal hormone, part of the linear peptides class without disulfide links.
2. Cells producing gastrine are called G cells.
3. Gastrine release is linked to activation of various chemicals on cells G. These substances are released either from blood or from other nerve endings or from stomach contents, which bathe the G cells microvilli. Blood stimulation of G cells is made through the levels of calcium and epinephrine.
4. Gastrine is the only peptide hormone released from the stomach which mediates gastric acid secretion, with a well established physiological significance.
5. Gastrine is considered an important trophic hormone for the production of stomach acid: it increases the weight and thickness of the lining oxyntic, and, on the other hand, removal of endogenous gastrine has opposite effects.
6. Acetylcholine is a synaptic transmitter in the central nervous system, the

autonomic and ganglionic synapses, neuromedulosuprarenal glands, at all terminal parasympathetic synapses and some sympathetic terminal synapses, and motor terminal plate synapses.
Rolul gastrinei si acetilcolinei

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