Computer simulation of multiple neurotransmission in the human gastric antrum

Author: Saleh Rowaili
The Arabian Gulf University, College of Medicine and Medical Sciences, *Bahrain*
Co-author: Roustem Miftahof
The Arabian Gulf University, College of Medicine and Medical Sciences, *Bahrain*

Abstract

The aim of the study is analyze *in silico* the conjoint action of acetylcholine (ACh), nitric oxide (NO) and high concentrations of motilin (Mot) on myoelectrical activity of the gastric antrum under complex physiological stimuli.

Acting alone at increasing doses, Mot steadily depolarizes smooth muscle, reduces the amplitude and shortens the duration of slow waves. These changes correspond to a significant rise in the basal muscle tone and the active force, T^a = 16.1 mN/cm. The mechanical stretching of the antrum at a high frequency and the subsequent release of ACh, results in the production of regular high amplitude spikes on the crests of slow waves. Smooth muscle responds with strong phasic contractions, T^a = 8.3 mN/cm. The application of Mot at 50-100 nM does not affect the cholinergically mediated myoelectrical activity, although it evokes contractions of inconsistent amplitudes: T^a = 2.9-8.3 (mN/cm). The release of a "puff" of NO to the gastric antrum which has been exposed to ACh and Mot, fails to exert any inhibitory effect. When the addition of NO precedes ACh and Mot acute short-lasting relaxations with minT^a = 7.7 mN/cm are observed. The asynchrony between the firing rate of interstitial cells of Cajal and the presence of Mot at 85 nM, causes the production of active forces of wavering strength. The antrum fails to relax completely. A lower frequency of ganglionic activity allows a greater degree of relaxation, T^a = 8 mN/cm, and contractions of larger amplitude, 9.9 mN/cm.

The results have unveiled intricacies of co-transmission by multiple neurotransmitters in the antrum of the human stomach and the dynamics of active forces development. The chronotropic allosteric interaction among ACh, NO, Mot and interstitial cells of Cajal plays a pivotal role in coordinated motor activity of the organ. Abnormalities in their interplay could lead to motor dysfunction.

Biography

Saleh Rowaili is a researcher at the Computational Biology and Medicine Centre at the Arabian Gulf University, Manama, Bahrain. Saleh studies *in silico* effects of multiple neurotransmission and receptor polymodality in the human stomach. He has presented results of his research at a conference and scientific seminars.

Email ID: saleh2030bh@gmail.com

Presenter Name: Saleh Rowaili
Type of Presentation: Poster
Contact Number: (+973) 36767274

