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Model predictions of myoelectrical activity of the small bowel

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Abstract

A mathematical model for the periodic electrical activity of a functional unit of the small intestine is developed. Based on real morphological and electrophysiological data, the model assumes that: the functional unit is an electromyogenic syncytium; the kinetics of L, T-type Ca2+, mixed Ca2+-dependent K+, potential sensitive K+ and Cl- channels determines electrical activity of the functional unit; the basic neural circuit, represented by a single cholinergic neurone, provides an excitatory input to the functional unit via receptor-linked L-type Ca2+ channels. Numerical simulation of the model has shown that it is capable of displaying the slow waves and that slight modifications of some of the parameters result in different electrical responses. The effects of the variations of the main parameters have been analyzed for their ability to reproduce various electrical patterns. The results are in good qualitative and quantitative agreement with results of experiments conducted on the small intestine.