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Signal transmission mechanisms through exocytosis in nematode enterocytes compared to similar mechanisms in nervous tissue

Научный руководитель – Панчин Юрий Валентинович

Дрозд Я.Г.[1], *Кузнецов В.П.*[2], *Сливко-Кольчик Г.А.*[3]

1 - Московский государственный университет имени М.В.Ломоносова, Факультет биоинженерии и биоинформатики, Москва, Россия, *E-mail: drozd.janin@gmail.com*; 2 - Институт проблем передачи информации им. А.А. Харкевича РАН, Москва, Россия, *E-mail: scikvp@gmail.com*; 3 - Институт проблем передачи информации им. А.А. Харкевича РАН, Москва, Россия, *E-mail: s.koltchik@gmail.com*

It is commonly supposed that neurons are the only cells that are able to regulate the activity of body systems, respond to changes in the internal and external environment and control complex mechanisms and excitable cells. However, this is true not for all organisms. Intestinal enterocytes of nematodes have acquired unusual "neuronal" functions during the evolution. Along with the food processing, nutrient extracting and transferring them to other tissues, endodermal nematode cells also can regulate the activity of different body systems, respond to changes in the internal and external environment, and even control the complicated mechanism of programmed organism death. One of these procesess that attract attention is the nematode rhythmic defecation. Most part of this complex process is controlled by the intestinal cell without nervous system participation [1]. This rhythmical behaviour is perfectly timed, and intestinal cells transmit timing information among themselves and target tissues that execute rhythmic outputs. This phenomenon has been discussed in a series of articles published earlier [2,3,4]. The present study is a continuation of them. In this work some open data of Caenorhabditis elegans single-cell RNA-seq were analyzed to check the genes involved in neuronal signal transmission activity. The goal was to try to draw an analogy between the nematode intestine cells and the classical neurons. The comparison of genes expression for exocytosis in different types of nematode cells made possible to determine the most expressed genes in the enterocytes. An evolutionary analysis has been carried out for one of these genes, such as synaptotagmin. We studied the data about the presence of synaptotagmin protein in different groups of multicellular animals and compared the synaptotagmins of different organisms. Obtained results show that the nematode intestine has some parts of neuronal presynaptic machinery and also confirm the presence of exocytosis in intestinal cells, carried out with the help of the synaptotagmin protein. It can be considered as one more evidence of similarity between the nematode intestine cells and the neurons. These findings give the possibility to flip the neuronal evolution around and call for a reevaluation of the excitable cells definition.

Источники и литература

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