Genome editing tool for studying *Ciona robusta* nervous system differentiation

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By

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Abstract

The development of the central nervous system (CNS) depends on complex gene regulatory networks (GRN) that orchestrate the specification, patterning and differentiation of neural cell types. Taking advantage of the unique characteristics of a simple chordate, the ascidian *Ciona robusta*, I identified a group of genes, expressed in the nervous system of *Ciona*, to investigate the network that controls specification inside the central and peripheral nervous system. The approach used to study functionally these genes has been the gene editing, performed by CRISPR/cas9 technique, indeed in this work I had the opportunity to evaluate the whole process of this emerging technique, preparing and testing several sgRNAs on the selected genes. Moreover, I focused my attention on a type of sensory neuron, belonging to the peripheral nervous system, Bipolar tail neurons (BTNs), through the investigation of two poorly studied genes, *Rimbp* and *LZTS*, both expressed in the BTNs neurons. This thesis amplified the knowledge on their involvement in the gene regulatory network of BTNs during *Ciona* nervous system development. Here I showed that CRISPR/Cas9-mediated knockout of *LZTS* in the epidermis results in extra BTNs, suggesting *LZTS* functions as a repressor during differentiation and specification of BTNs. All these data provide new insight into the development of the *Ciona* nervous system, encouraging further studies to clarify and confirm *LZTS* role in the *Ciona* nervous system development.