Neuronal differentiation induced by thermal stimulation: the role of possible candidate ion channels

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Abstract:
We have previously shown the results obtained by an approach for scalable thermal stimulation on the behaviour of a model of dorsal root ganglion neurons, the F-11 cell line. The thermal stimulation consisted of 30 minutes at 41.5°C by near infrared laser (NIR) irradiation of Prussian Blue nanoparticles (PBNs) or by bulk heating in an incubator. The application of the protocol for two consecutive days was efficient to induce F-11 cell morphological and functional differentiation. In fact, significant increase in neurite elongation and more intense electrical activity were recorded from heated cells compared to control cells maintained at 37°C.

To understand the mechanisms underlying this differentiation, we hypothesized that the members of a family of temperature-sensitive channels could be involved. These channels are possible candidates because they activate in the same range of temperatures of our protocol and are calcium permeant channels.

By immunocytochemical analysis and by Ca^{2+} signals, induced via channel activation by specific agonists, we are investigating their expression in F-11 cells.

Our future purpose is to silence their genes in order to verify the possibility to counteract the induction of neuronal differentiation and to demonstrate their involvement as preferential mechanisms to modify F-11 cell behaviour.