Long distance plasticity: on connectomes e dysconnectomes

Roberto Lent*

The human brain has about 86 billion neurons and a similar number of glial cells. As a whole, these neurons form trillions of circuits during development and thereafter along the whole life, and besides, both neurons and circuits are plastic! Considering this scenario, is it really possible to unravel a connectome of the human brain? Plasticity determines the variability of normotypic individual connectomes, and also the emergence of dysconnectomes when something goes wrong during (and after) development. To foster discussion on this issue, I will report evidence from my lab and others, describing plastic variations in brain cellularity after different external and internal conditions, and in long distance circuits in humans and in animal models. Firstly, I will describe how the absolute number of neurons in the brain departs from the normal average after physical exercise, aging, epilepsy and dementia. Focus will then be directed onto both developmental and adult plasticity of brain circuits. In this case I will describe work in animals and humans, as well, showing that connections change when a limb is amputated, and a complex dysconnectome of cortical circuits form when the corpus callosum fails to develop correctly. The proposal for discussion is that a "standard" hardware of the brain in fact may not exist, given the fact that neurons and circuits undergo extensive, continuous changes all along life. Therefore, it is reasonable to question efforts to unravel the "human connectome", as if a fixed circuitry would be formed under genomic control, unchangeable in face of environmental challenges.

* Professor of Neuroscience, Institute of Biomedical Sciences, Federal University of Rio de Janeiro.