EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

CIN
Werner Reichardt
Centre for Integrative
Neuroscience

How Touch and Movement Contribute to the Development of the Brain

Neuroscientist at the Excellence Cluster CIN at the University of Tübingen together with French colleagues uncovered in an animal model the neuronal processes that underlay the development of sensory maps in the developing brain.

Every expectant mother is aware of fetal movements in the late stages of pregnancy. It is known that the frequency of fetal movements is correlated with the physical fitness of the newborn child. What is the functional role of these irregular, non-coordinated movements in the brain development? And what are the neuronal processes that facilitate the brain development in result of these movements? The Neuroscientists Dr. Anton Sirota from the Excellence Cluster Werner Reichardt CentRE for Integrative Neuroscience (CIN) and Dr. Rustem Khazipov from the Institut National de la Santé et de la Recherche Médicale (INSERM) in France pursue these questions in an intensive and long standing collaboration. In an article published in the current issue of the scientific journal Science they could show that this process is controlled by so called early gamma oscillations (EGO) in the developing brain.

In the first week of life newborn rats are at a similar developmental stage as children in the third trimester of pregnancy. Newborn rats display perpetual twitches and jerks reminiscent of the human fetal movements.These spontaneous twitches as well as passive touches help to establish neuronal topographical maps of the body parts in the brain. Each stimulation of a single whisker (through twitches of the snout or the touch of mother or littermates) results in an unique pattern of neural activity, that the authors termed “early gamma oscillations” (EGO), which are exclusively confined to neural circuits of the thalamus and neocortex, which are genetically pre-wired to represent this particular whisker. The sensory information of the whisker and the neuronal activity during development are instrumental for establishing a functional topographic map of the sensory information. The high frequency of EGO of about 40 Hz is essential for strengthening neuronal connections. Every repetition strengthens further the connections between neurons in cortex and thalamus into a topographic and functional unit. During the maturation of the brain and the neuronal machinery, the EGO gradually disappear and they are being replaced by gamma oscillations of the adult which serve horizontal binding and other integrative cortical functions in the mature brain.

Contact:

Dr. Anton Sirota
University of Tübingen
Werner Reichardt Centre for Integrative Neuroscience (CIN)
Paul-Ehrlich-Straße 15
72076 Tübingen
Telefon +49 7071 29-89160
anton.sirota@cin.uni-tuebingen.de
http://www.cin.uni-tuebingen.de/research/research-groups/physiology-of-cortico-hippocampal-interaction-sirota.php


Anton Sirota