URL: http://www.uni-jena.de/en/PM090817_L%C3%B6wel_ResGroup.pdf

Learning after the stroke

BMBF grants more than EUR 3 million for interdisciplinary research group coordinated by Prof. Dr. Siegrid Löwel

An occluded or burst blood vessel - and the blood supply through the brain is interrupted: stroke. In Germany alone, approximately 200,000 people have a stroke every year. A fast intensive care saves the lives of many persons affected. But more than two third of the patients suffer from permanent damages. Much of what has been normal before - walking, speaking, and eating - must be learnt again. Often, however, patients cannot recover all their initial abilities.

Why learning is so arduous and often futile after a stroke is to be investigated by scientists from the Jena University and Hospital and a partner in Göttingen in an interdisciplinary research project. In the framework of the funding initiative "Bernstein Focus: Neuronal Basis of Learning", the Federal Ministry of Education and Research (BMBF) plans to fund the collaborative project in an amount of more than EUR 3 million. More than EUR 2.5 million of that go to Jena. The research collaboration is part of the National Network Computational Neuroscience.

"*We aim at exploring the reasons for the brain's restricted ability to learn after a stroke*", says Prof. Dr. Siegrid Löwel from the University of Jena. The professor of General Zoology and Animal Physiology at Jena University coordinates the research project. Apart from Prof. Löwel and her team, neurologists around Prof. Dr. Otto W. Witte and Prof. Dr. Knut Holthoff at Jena University Hospital as well as Prof. Dr. Christian Hübner from the Jena Institute of Clinical Chemistry and Laboratory Medicine are involved in the research project. "*On a long-term basis, we wish to develop therapies that help recover the learning ability of the brain.*" Another partner supporting the consortium is the theoretical physicist Prof. Dr. Fred Wolf from the Max-Planck-Institute for Dynamics and Self-Organization in Göttingen.

Study the placticity of the brain

The researchers' basic approach depends on the following observation: Due to the shortage of oxygen not only the brain cells immediately next to the stroke are damaged. "*From our own studies we know that regions of the brain not immediately affected by the stroke suffer from a loss of plasticity as well*", states Löwel. Plasticity in a neurological sense means the ability of brain cells to keep forming new synapses with other neurons if demanded. This is the basis of each learning process.

Which non-local control mechanisms are responsible for the interaction of two distant areas of the brain, the researchers try to find out with the help of experiments on mice. "*Using mouse models allows a precise study of how learning, for instance learning to see, works*", emphasizes Prof. Löwel. On the one hand, the visual system of mice is a well characterized animal model for the plasticity of the brain. On the other hand, the researchers from Jena will combine two special imaging techniques for the first time in the framework of the project. They are available only at a

handful of institutions: 1. The optical imaging of nerve cell activity that allows to visualize activity patterns of the brain at a much higher spatial resolution than e.g. an MRI scanner (Löwel Lab). 2. The 2-photon microscopy in vivo (Profs. Holthoff/Witte) which is able to additionally visualize the activity of single brain cells.

The project will be funded for three years. If evaluated positively the team can expect further funding by the BMBF for two more years.

Contact:
Prof. Dr. Siegrid Löwel
Institute of General Zoology and Animal Physiology at Friedrich-Schiller-University Jena
Ebertstraße 1
D-07743 Jena
Phone: +49 (0)3641 949131
Email:

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