Method of accelerating the maturation of stem cells to form neurons discovered

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Very little is still known about how neurons can be generated from stem cells. Researchers at the University Medical Center of Johannes Gutenberg University Mainz (JGU) have now developed a promising technique that will facilitate the differentiation of stem cells into neurons. This even enables them to accelerate the maturation process. For this purpose, they use a hydrogel to create a stiffness-controlled scaffold for artificial brain tissue that furthermore stimulates the development of neurons. The team subsequently plans to investigate how hydrogel-based biomaterials can be injected into severely damaged brain regions in order to improve brain tissue regeneration. Over the long term it is hoped it will be possible to provide help to stroke victims or those suffering from neurodegenerative diseases. The Mainz-based researchers have recently published their findings in the leading journal *Stem Cell Reports*.

"We used a new type of biomaterial in our experiments. Its structure and consistency can be modified to create properties similar to those of the human brain. It has the same elasticity as cerebral tissue and has special adhesive molecules that promote neuronal fate and neurogenesis, thus creating the ideal conditions for neurogenesis," said Dr. Marcelo Salierno of the Institute of Physiological Chemistry at the Mainz University Medical Center, who is heading up the project. Salierno is a member of Professor Benedikt Berninger's research team at the Institute of Physiological Chemistry.

In addition to the physiological proteins present in the brain, the

hydrogel also contains the synthetic adhesive molecule IKVAV. The resulting biomaterial accelerates the process and increases the chances to generate neurons from neural stem cells. Salierno was able to demonstrate this effect in his experiments. "The combination of the two factors, i.e., neural surface adhesion and the brain-like elasticity of the material, foster the controlled development of stem cells into neurons," added Salierno.

The series of experiments undertaken by the scientists working with Dr. Marcelo Salierno were initially performed in vitro. As a result, the researchers were able to observe how the new biomaterial interacts with human cells and how stem cells differentiate into neural cells. "The next step would be to modify the hydrogel so that it would be possible to inject it into damaged brain regions," explained Salierno. "These are the very first steps along a very ambitious path but we believe that in the near future those suffering from neuronal degeneration will benefit from our discovery."

More information: Aleeza Farrukh et al, Bifunctional Hydrogels Containing the Laminin Motif IKVAV Promote Neurogenesis, *Stem Cell Reports* (2017). DOI: 10.1016/j.stemcr.2017.09.002

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