New source discovered for the generation of nerve cells in the brain

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The research group of Professor Magdalena Gotz of Helmholtz Zentrum Munchen and Ludwig-Maximilians-Universitat Munich (Germany) has made a significant advance in understanding regeneration processes in the brain. The researchers discovered progenitor cells which can form new glutamatergic neurons following injury to the cerebral cortex.

Particularly in Alzheimer's disease, nerve cell degeneration plays a crucial role. In the future, new therapeutic options may possibly be derived from steering the generation and/or migration mechanism. These findings have been published in the current issue of the renowned journal Nature Neuroscience. Until only a few years ago, neurogenesis - the process of nerve cell development - was considered to be impossible in the adult brain. The textbooks asserted that dead nerve cells could not be replaced. Then researchers discovered regions in the forebrain in humans in which new nerve cells can be generated throughout life. These so-called GABAergic cells use gamma-aminobutyric acid (GABA), a neurotransmitter of the central nervous system.

A research team of scientists led by Magdalena Götz, director of the Institute of Stem Cell Research at Helmholtz Zentrum München and chair of the Department of Physiological Genomics of LMU, has now taken a closer look at this brain region in the mouse model. Their findings: Even in the forebrain, there are other nerve cells that are regularly generated - the so-called glutamatergic nerve cells, which use glutamate as neurotransmitter. The stem cell researchers could prove this by means of a specific transcription factor: Tbr2 is only present in

progenitor cells of glutamatergic nerve cells.

The newly generated nerve cells in the adult organism are located in the olfactory bulb, the region of the brain involved in the sense of smell. Nerve cells that use glutamate as a neurotransmitter are also responsible for memory - storing and retrieving information. In Alzheimer dementia, alterations in the signal transduction pathways of these special cells play a significant role.

Magdalena Götz explained the reason why this finding is so important: "Neural progenitor cells can generate these newly discovered glutamatergic nerve cells for the neighboring cerebral cortex - for example after brain injury." The research group was able to demonstrate this on the mouse model: There the cells migrated into the damaged neighboring cerebrum tissue and generated mature neurons. Accordingly, progenitor cells could then replace degenerate nerve cells.

"Now it will be interesting to find out whether this process also takes place in humans, particularly in Alzheimer's patients," said Magdalena Götz, "and also whether the process can be kept under control to avoid massive cell death." One therapeutic approach would then be to attempt to stimulate the body's own replacement mechanism.

More information: Monika S Brill, Jovica Ninkovic, Eleanor Winpenny, Rebecca D Hodge, Ilknur Ozen, Roderick Yang, Alexandra Lepier, Sergio Gascón, Ferenc Erdelyi, Gabor Szabo, Carlos Parras, Francois Guillemot, Michael Frotscher, Benedikt Berninger, Robert F Hevner, Olivier Raineteau & Magdalena Götz: *Nature Neuroscience*, Volume 12 No 11 pp1351-1474 (doi:10.1038/nn.2416)

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