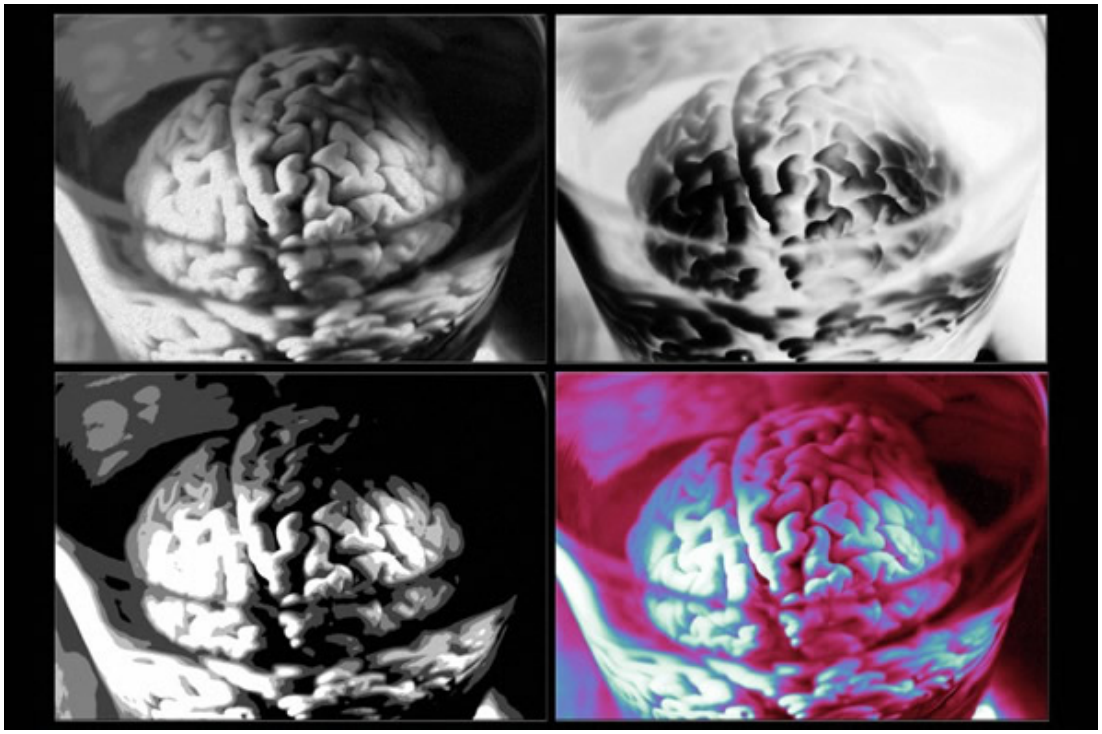
Scientists discover neuron-producing stem cells in the membranes covering the brain

November 23, 2016 | VIB - Flanders Institute for Biotechnology



Credit: Heidi Cartwright, Wellcome Images

Discovery brings with it possible implications for brain regeneration -

In a cross-domain study directed by professor Peter Carmeliet (VIB - KU Leuven), researchers discovered unexpected cells in the protective membranes that enclose the brain, the so called meninges. These 'neural progenitors' (stem cells that differentiate into different kinds of neurons) are produced during embryonic development.

See Also: Stem cells in the brain: Limited self-renewal

These findings show that the neural progenitors found in the meninges produce new neurons after birth, highlighting the importance of meningeal tissue as well as these cells' potential in the development of new therapies for brain damage or neurodegeneration. A paper highlighting the results is published in the journal *Cell Stem Cell*.

Scientists' understanding of brain plasticity, or the ability of the brain to grow, develop, recover from injuries and adapt to changing conditions throughout our lives, has been greatly broadened in recent years. Before the discoveries of the last few decades, neurologists once thought that the brain became 'static' after childhood. This dogma has changed, with researchers finding more and more evidence that the brain is capable of healing and regenerating in adulthood, thanks to the presence of stem cells. However, neuronal stem cells were generally believed to only reside within the brain tissue, not in the membranes surrounding it.

The meninges: unappreciated no more

Believed in the past to serve a mainly protective function to dampen mechanical shocks, the meninges have been historically underappreciated by science as having neurological importance in its own right. The data gathered by the team challenges the current idea that neural precursors—or stem cells that give rise to neurons—can only be found inside actual brain tissue.

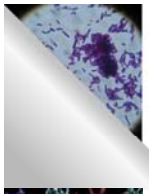
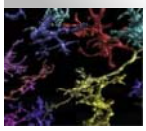
Learn More: Scientists sniff out unexpected role for stem cells in the brain

Prof. Peter Carmeliet notes: "The neuronal stems cells that we discovered inside the meninges differentiate to full neurons, electrically-active and functionally integrated into the neuronal circuit. To show that the stem cells reside in the meninges, we used the extremely powerful single-cell RNA sequencing technique, a very novel top-notch technique, capable of identifying the [complex gene expression signature] nature of individual cells in a previously unsurpassed manner, a première at VIB."

Following up on future research avenues

When it comes to future leads for this discovery, the scientists also see possibilities for translation into clinical application, though future work is required.

"An intriguing question is whether these neuronal stem cells in the meninges could lead to better therapies for brain damage or neurodegeneration. However, answering this question would require a better understanding of the molecular mechanisms that regulate the differentiation of these stem cells," says Carmeliet. "How are these meningeal stem cells activated to become different kinds of neurons? Can we therapeutically 'hijack' their regeneration potential to restore dying neurons in, for example, Alzheimer' Disease, Parkinson's Disease, amyotrophic lateral sclerosis (ALS), and other neurodegenerative disorders? Also, can we isolate these neurogenic progenitors from the meninges at birth and

use them for later transplantation? These findings open up very exciting research opportunities for the future."

Moving into unchartered territory is high risk, and can offer high gain, but securing funding for such type of research is challenging. However, Carmeliet's discoveries were made possible to a large extent by funding through "Opening the Future: pioneering without boundaries", a recently created Mecenas Funding Campaign for funding of high risk brain research but with potential for breakthrough discoveries, started up by the KU Leuven in 2013 and unique in Flanders.

Read Next: A better way to grow motor neurons from stem cells

"Being able to use such non-conventional funding channels is of utmost importance to break new boundaries in research," says Carmeliet. "This unique Mecenas funding initiative by the KU Leuven is innovative and boundary-breaking by itself. Our entire team is enormously grateful for the opportunities it has created for our investigations".

Note: Material may have been edited for length and content. For further information, please contact the cited source.

VIB - Flanders Institute for Biotechnology press release

Publication

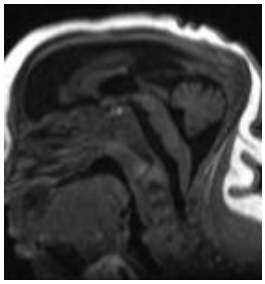
Bifari F *et al.* *Neurogenic Radial Glia-like Cells in Meninges Migrate and Differentiate into Functionally Integrated Neurons in the Neonatal Cortex.* Cell Stem Cell, Published Online November 23 2016. doi: 10.1016/j.stem.2016.10.020

Similar Stories On …
stem cells, cortex, brain development, plasticity, neurogenesis

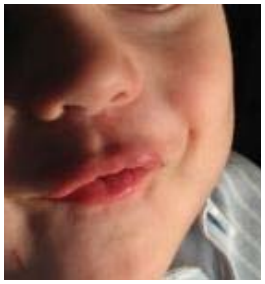
More *Research News*

Building stress-resistant memories - Practice testing offers protection

Your dog remembers what you did



New studies provide more insight into Zika effects



Stuttering related to brain circuits that control speech production

Recommended from the Web

Corals Show Genetic Plasticity

Inshore corals thrive in a chaotic ecosystem thanks to…

Stem Cells Drive Cancer Risk…

Mutations that arise during stem cell division contribute…

Donor Stem Cells Improve…

After a heart attack, monkeys given induced pluripotent…

How Experience Shapes Adult…

Interneurons and mature granule cells in the adult mouse…

comments

email sign up

Receive the latest updates on neuroscience research and discoveries in your inbox.