How do our brain cells age?

The health of nerve cells is closely linked to the auxiliary cells that surround them, the so-called glial cells. It still remains largely unknown what role glial cells play in age-related diseases. A research network led by the Hertie Institute for Clinical Brain Research, the Deutsches Zentrum für Neurodegenerative Erkrankungen (DZNE), and the University of Tübingen is now investigating how nerve cells age and become susceptible to neurodegenerative diseases, utilizing human brain tissue cultures.

The researchers are testing the hypothesis that neuronal dysfunction is primarily caused by changes in glial cells. The study, which is now underway, is being funded with 1.6 million US dollars (current equivalent to 1.6 million euros) from the Chan Zuckerberg Initiative, as the philanthropy of Facebook founder Mark Zuckerberg and his wife Dr. Priscilla Chan announced this week.

“We are very pleased to receive this financial support, which will allow us to implement the project,” study lead Dr. Deborah Kronenberg-Versteeg says. “The cellular aspects of aging are extremely exciting: what are the interactions between the different cells in the brain? And what factors contribute to neurons becoming susceptible to age-related dysfunction and disease?”. A better understanding of the processes involved may be key to extending health span, the neurobiologist says. The project is a joined effort between the research groups of Dr. Deborah Kronenberg-Versteeg, Dr. Thomas Wuttke (Hertie Institute for Clinical Brain Research/University of Tübingen) and Dr. Henner Koch (Department of Neurology, Uniklinik RWTH Aachen, formerly also Hertie Institute for Clinical Brain Research).

For the study, the team is using tissue from patients obtained during brain surgery. “In order to reach a deeper-lying brain tumor or an epileptic focus, it is often necessary to remove healthy tissue that blocks the way,” Kronenberg-Versteeg explains. If the patient agrees, the researchers can then examine this tissue in the Petri dish.

In a targeted manner the cultured tissue will be allowed to become diseased in order to better understand age-related disease processes. “We do this with the help of so-called ‘seeds’,” says Kronenberg-Versteeg. “These are small clumps of misfolded proteins that cause pathological changes in nerve cells, resulting in neurodegenerative diseases such as Alzheimer's or Parkinson's.”

In this way, the research team is able to take a detailed look at the molecular and cellular level, and probe which factors play into the disease process in the nerve and glial cells and how both these cell types interact with each other. The team established the method as part of a pilot study that has also been funded by the Chan Zuckerberg Initiative.

“Research on real human tissue has many advantages over other methods. Human tissue has the same age, structure and composition as its donor. This high degree of individuality limits the generalization of the knowledge gained,” says Kronenberg-Versteeg. “On the other hand, the individuality of the tissue depicts the conditions in a highly realistic manner and thus offers an enormously wide range of possible insights.”

Press release

04-Nov-2022
Source: University of Tübingen

Further information

Dr. Deborah Kronenberg-Versteeg
University of Tübingen
Hertie Institute for Clinical Brain Research
Deutsches Zentrum für Neurodegenerative Erkrankungen (DZNE)
Tel.: +49 (0) 7071 29 87596

E-Mail: deborah.kronenberg-versteeg(at)uni-tuebingen.de

- Eberhard Karls University of Tübingen
- Hertie Institute for Clinical Brain Research
- German Center for Neurodegenerative Diseases DZNE