Protein changes in the liquor indicate inflammatory processes in the brain

Alzheimer's, Parkinson's and other neurodegenerative diseases are associated with inflammatory processes in the brain. German researchers have succeeded in identifying a group of proteins in the liquor that could provide information about such inflammatory processes. As so-called biomarkers, the proteins could help to better understand disease processes in the future and to test the effect of potential drugs against brain inflammation.

The research team led by Stephan Käser and Professor Dr. Mathias Jucker at the Hertie Institute for Clinical Brain Research and the University of Tübingen, in collaboration with Professor Dr. Stefan Lichtenthaler from the Munich site of the German Center for Neurodegenerative Diseases, has now published its study in the journal *PNAS*.

“Inflammatory processes in the brain are common in Alzheimer's and Parkinson's disease,” explains Käser, who lead the study. “In these processes, so-called microglial cells play an important role.” Microglia normally protect our brain from harmful pathogens and substances. In the case of a neurodegenerative disease, the cells are chronically active and secrete substances themselves, Käser says. “We suspect that this reaction initially has a positive effect on the course of the disease, and then turns into a negative impact later on.”

To learn about the dynamic inflammatory reactions in the brain, the Tübingen research team has now searched for possible molecular biomarkers. Biomarkes are substances whose presence or change in concentration in the body indicates a disease process. They can be measured in blood, urine or other body fluids and are an important tool for medical diagnostics or for monitoring the course of a disease.

In the current study, the neuroscientists analyzed cerebrospinal fluid from mice showing characteristic pathologies of Alzheimer's disease or Parkinson's disease. “Using state-of-the art measurement technology, we were able to measure more than 600 proteins simultaneously in just two microliters of liquor—a tiny drop of fluid,” Käser reports. “We found that the concentration of 25 proteins was altered in both mouse models compared with healthy animals of the same age.”

“Remarkably, the majority of these proteins originate from or are associated with microglial cells,” the neuroscientist continues. “Virtually all of them can also be found in human cerebrospinal fluid and are altered in Alzheimer's patients.” The changed concentrations of the proteins could reflect different stages of glial cell activity. Thus, they have the potential to serve as biomarkers for various states of brain inflammation, Käser says.

“The ability to measure inflammatory responses in the cerebrospinal fluid would be a major advance,” co-author Jucker explains. “This would allow us to better understand different disease stages and also to test anti-inflammatory substances in clinical trials.” This way, the new findings from the laboratory would find practical application in patient care and be a good example of translational brain research.

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