Understand

AI and 3D human 'mini brains' may uncover genetic cause of Alzheimer's disease

What is the focus of the research?

Using gene-editing technology to remove DNA errors that may cause Alzheimer's disease.

Why is this important?

Mistakes in our DNA might be responsible for the development of Alzheimer's disease, which is the most common form of dementia.

Using artificial intelligence, Dr Caitlin Finney uncovered two of these genetic mistakes and showed that they're more common on people who have been diagnosed with Alzheimer's disease.

In this groundbreaking project, her team is taking these findings to the next level. Dr Finney will collect skin cells from people living with the disease to grow human 'mini brains' in a dish. She will monitor how Alzheimer's disease develops in the brains, then use a specialised gene editing tool to remove these genetic errors to see if it prevents the disease from developing.

This cutting-edge combination of artificial intelligence and mini brains grown from real people will increase the chances of researchers uncovering previously unknown genetic errors that cause Alzheimer's disease.

If Dr Finney determines that these genetic mistakes are the root cause, it will open the door for scientists to create personalised medical treatments that fix these deadly errors and stop Alzheimer's disease in its tracks.

How will it happen?

Stage 1: collect skin cells from people with Alzheimer's disease and reprogram them to grow four different mini brain models: two with the genetic mistakes and two where those mistakes have been corrected.

Stage 2: use advanced imaging techniques to observe how the genetic mistakes interact with other specific proteins that are known to cause Alzheimer's disease.

Stage 3: use a combination of techniques to investigate how these mistakes impact cellular function. Analyse the findings with specialised statistical modelling to uncover relationships between the cellular changes and the mistakes.

What could this mean for research?

- Critical new understanding of how genetics may cause Alzheimer's disease.

- New avenues to create personalised treatments that target our DNA.

What are mini brains?

3D models of human brain tissue which are grown from stem cells that mimic brain activity. They will allow Dr Finney to accurately and reliably explore how these genetic errors may cause Alzheimer's disease in some people.

Who's undertaking the research?

Dr Caitlin Finney, The University of Sydney

Dr Finney is a neuroscientist who focuses on the study of Alzheimer's disease and related dementias. She received her PhD from the University of New South Wales in 2021, where she tested a new treatment for post-stroke dementia. Dr Finney is currently a senior post-doctoral researcher at The Westmead Institute for Medical Research and The University of Sydney.

The title of Dr Finney's project is *Precision medicine for late onset Alzheimer's disease using machine learning and human-derived 3D brain models.*

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