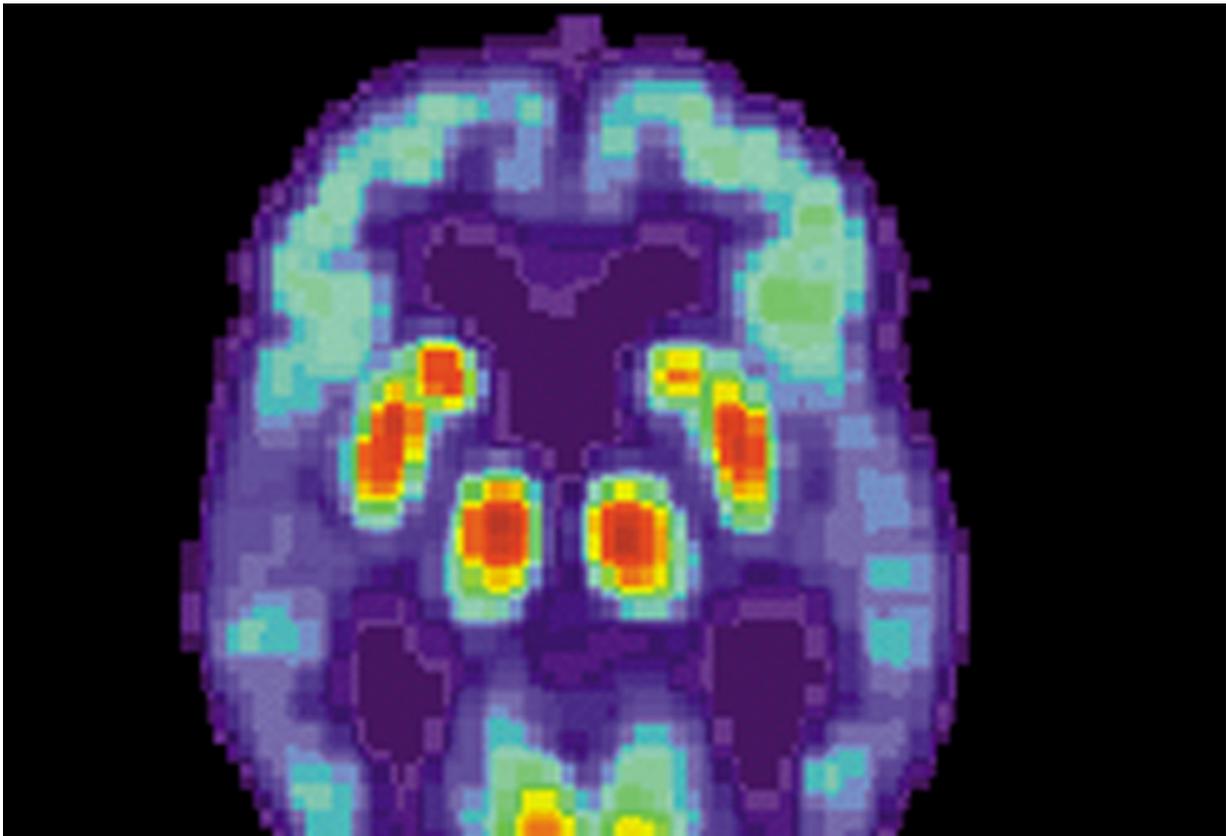


Pathway of Alzheimer's degeneration discovered

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PET scan of a human brain with Alzheimer's disease. Credit: public domain

Scientists at the Montreal Neurological Institute and Hospital (The Neuro) of McGill University have used a unique approach to track brain degeneration in Alzheimer's disease, uncovering a pathway through

which degeneration spreads from one region to another.

Individuals in the early stages of Alzheimer's disease (AD) were scanned using both structural [magnetic resonance imaging](#) (sMRI) and [positron emission tomography](#) (PET). The scientists were interested in how AD affects the basal forebrain—a deep brain structure that supplies the [outer cortex](#) with acetylcholine, a neurotransmitter that is critical for maintaining normal brain function. They found that as [cholinergic neurons](#) in the basal forebrain degenerate, the areas in the cortex which receive their cholinergic inputs also degenerate.

Based on post-mortem examinations of brain tissue, it has been known for quite some time that the cholinergic neurons are particularly vulnerable to degeneration in Alzheimer's disease. However, this study is among the first in which scientists were able to track degeneration of cholinergic neurons in living humans. "A key finding from this study is that the results from sMRI scans matched what we were seeing on PET scans, despite the fact they provide different types of measurements and were performed on different patients" said Dr. Nathan Spreng, Director of the Laboratory of Brain and Cognition at The Neuro. "The combination of PET with sMRI may therefore represent be a powerful tool for tracking the progression of Alzheimer's disease in living patients."

"This study shows PET and sMRI scans could potentially be used to diagnose Alzheimer's disease before cognitive symptoms appear, giving doctors a better window of time to work on prevention," said Taylor Schmitz, researcher in Dr. Spreng's lab and the study's lead author. "Drugs that promote the delivery of acetylcholine to these cortical regions could be one way to prevent degeneration."

The results of this study were published in the journal *Cell Reports* on July 3, 2018. Schmitz says that he would like to follow up with a larger

study of patients in earlier stages of the [disease](#), and perform structural MRI and PET on the same patients to confirm the previous study's results.

More information: Taylor W. Schmitz et al. Longitudinal Alzheimer's Degeneration Reflects the Spatial Topography of Cholinergic Basal Forebrain Projections, *Cell Reports* (2018). [DOI: 10.1016/j.celrep.2018.06.001](#)

Provided by McGill University

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