

Risk and progression of Alzheimer's disease differ by sex

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The abnormal accumulation of proteins in the brain is a biological marker for Alzheimer's disease, but the ways in which these proteins spread may help explain why the prevalence of Alzheimer's is higher in women than in men.

A recent study by researchers from the Center for Cognitive Medicine (CCI) at Vanderbilt University Medical Center identified differences in the spread of a protein called tau—which is linked to [cognitive impairment](#)—between men and women, with women showing a larger brain-wide accumulation of tau than men due to an accelerated brain-wide spread.

The findings were presented at the Alzheimer's Association International Conference July 14-18 in Los Angeles.

Accumulating evidence suggests that tau spreads through [brain tissue](#) like an infection, traveling from neuron to neuron and turning other proteins into abnormal tangles, subsequently killing brain cells. Using data from [positron emission tomography](#) (PET) scans of healthy individuals and patients with [mild cognitive impairment](#) who were enrolled in the Alzheimer's Disease Neuroimaging Initiative (ADNI) database, CCI researchers constructed in vivo networks modeling tau spread using graph theory analysis.

"It's kind of like reconstructing a crime scene after a crime. You weren't there when it happened, but you can determine where an intruder entered a house and what room they entered next," said Sepi Shokouhi, Ph.D., assistant professor of Psychiatry and Behavioral Sciences and lead investigator for the study. "The graph analysis does something similar to show how tau spreads from one region to another."

The results of the analysis showed the architecture of tau networks is different in men and women, with women having a larger number of "bridging

regions" that connect various communities in the brain. This difference may allow tau to spread more easily between regions, boosting the speed at which it accumulates and putting women at greater risk for developing Alzheimer's disease.

If proven, an accelerated spread of tau in women may indicate a need for sex-specific approaches for the prevention of Alzheimer's disease, including earlier therapies, lifestyle interventions and/or cognitive remediation. More studies are needed to validate the accelerated tau spread model in women.

"Understanding how different biological processes influence our memory is a really important topic. Sex-specific differences in the brain's pathological, neuroanatomical and functional organization may map into differences at a neurobehavioral and cognitive level, thus explaining differences in the prevalence of neurodegenerative disorders and helping us develop appropriate treatments," said Shokouhi.

Provided by Vanderbilt University Medical Center

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