

Researchers highlight brain region as 'ground zero' of Alzheimer's disease

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A critical but vulnerable region in the brain appears to be the first place affected by late onset Alzheimer's disease and may be more important for maintaining cognitive function in later life than previously appreciated, according to a new review of the scientific literature.

The locus coeruleus is a small, bluish part of the brainstem that releases norepinephrine, the neurotransmitter responsible for regulating [heart rate](#), attention, memory, and cognition. Its cells, or neurons, send branch-like axons throughout much of the brain and help regulate blood vessel activity. Its high interconnectedness may make it more susceptible to the effects of toxins and infections compared to other brain regions, said lead author Mara Mather.

Mather, Professor of Gerontology and Psychology at the University of Southern California Leonard Davis School of Gerontology, added that the locus coeruleus is the first brain region to show tau pathology—the slow-spreading tangles of protein that can later become telltale signs of Alzheimer's disease. Though not everyone will get Alzheimer's, autopsy results indicate that most people have some initial indications of tau pathology in the locus coeruleus by early adulthood, she added.

The norepinephrine released from the locus coeruleus may contribute to preventing Alzheimer's symptoms. Studies conducted with rats and mice have shown that norepinephrine helps protect neurons from factors that kill the cells and accelerate Alzheimer's disease, such as inflammation and excessive stimulation from other neurotransmitters.

Norepinephrine is released when someone is engaged in or mentally challenged by an activity, whether it's solving problems in the workplace, completing a word puzzle, or playing a difficult piece of music.

"Education and engaging careers produce late-life 'cognitive reserve,' or effective [brain](#) performance, despite encroaching pathology," Mather said. "Activation of the [locus coeruleus](#)-norepinephrine system by novelty and mental challenge throughout one's life may contribute to cognitive reserve."

More information: "The Locus Coeruleus: Essential for Maintaining

Cognitive Function and the Aging Brain" appears in *Trends in Cognitive Sciences* on Feb. 16, 2016: [dx.doi.org/10.1016/j.tics.2016.01.001](https://doi.org/10.1016/j.tics.2016.01.001)

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