

Vulnerability to depression linked to noradrenaline

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The team of Bruno Giros, a researcher at the Douglas Mental Health University Institute and professor of psychiatry at McGill University, reports the first-ever connection between noradrenergic neurons and vulnerability to depression. Published in the journal *Nature Neuroscience*, this breakthrough paves the way for new depression treatments that target the adrenergic system.

Stressful life events—job loss, accident, death of a loved one—can trigger major depression in one person, but not in another. A deciding factor is resilience, a biological mechanism that determines an individual's capacity to rebound from stressful or traumatic events. Researchers are still learning how resilience works.

"We know that a small cerebral structure, known as the [ventral tegmental area](#), contains dopaminergic neurons that play a key role in vulnerability to depression," explains Bruno Giros, whose team is part of the CIUSSS de l'Ouest-de-l'Île-de-Montréal research network. By mimicking [stressful life events](#) in animal models, the researchers confirmed that increased

dopaminergic neuron activity corresponds to depression.

Vulnerability under control

Their research further shows that a second type of neuron, noradrenergic neurons, controls dopaminergic [neuron activity](#). "It is this control that steers the body's response toward resilience or toward vulnerability to depression," says Giros.

Noradrenergic neurons are located in a cerebral structure named Locus coeruleus. These neurons communicate with each other using noradrenaline, a neurotransmitter molecule involved in emotional regulation, sleep and mood disorders—and, Giros now believes, resilience and depression.

By combining pharmacological, genetic and optogenetic (activation of the neurons activity by a light beam) approaches, Giros's team showed that animals that cannot release noradrenaline are systematically vulnerable to depression following chronic stress. This is not, however, an irreversible condition: increasing noradrenaline production results in higher resilience—and less depression.

"Beyond this discovery about the brain mechanisms involved in [depression](#), our results help explain how adrenergic drugs may work and could be used to treat [major depression](#)," Giros says.

More information: "Resilience against chronic stress is mediated by noradrenergic regulation of dopamine neurons," *Nature Neuroscience*, published online 15 February 2016. [DOI: 10.1038/nn.4245](#)

Provided by McGill University

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