

# Release of chemical dopamine in infant brains may help control early social development

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Changing levels of the chemical dopamine, a chemical most associated with motivation, may help explain why stressful experiences during

infancy can lead to lasting behavioral issues, a new study in rodents shows.

Experts have long understood that [negative experiences](#) early in life among rodents and other mammals, including humans, can affect later [social development](#). Past studies in rats, for example, have found that limited bedding causes mother rats to roughly handle pups, impacting pups' social behavior throughout their lives. However, exactly what changes occurred in the [brain](#) as a result of such adversity remained unclear.

In a study led by researchers at NYU Grossman School of Medicine, investigators tied repeated stress during infancy to increased dopamine levels in the [basolateral amygdala](#), (BLA), a brain region that plays a role in memory formation. When they housed mother rats and their new pups in stressful conditions while rearing their young, the stressed pups had about twice as much BLA activity compared with those raised in a more comfortable nest. In turn, the former group spent at least 90 percent less time near their mothers and over 30 percent less time near other pups compared with the latter group.

"Our findings suggest that repeated dopamine release in the basolateral amygdala plays a key role in infant social development," says study lead author Maya Opendak, Ph.D. "As a result, this region of the brain may be a promising target for understanding or even treating psychiatric disorders that can interfere with [social interaction](#), such as autism, anxiety, and depression."

As part of the study, the study authors artificially blocked dopamine release in the BLA in the distressed infants and found that social behavior returned to normal. By contrast, increasing dopamine levels in pups raised in non-stressful conditions impaired their social behavior.

Opendak, a postdoctoral research fellow in the Department of Child and Adolescent Psychiatry at NYU Langone Health, notes that elevated BLA activity and social impairment only occurred in pups that were stressed in their mother's presence. If they experienced stress alone, they showed no sign of these issues. Opendak suggests that the repeated activation of the BLA, already known to play a key role in learning about threats, prompts infants to associate their mother with danger.

"Our investigation offered us a clearer look at how specific brain mechanisms link [stressful experiences](#) during infancy to lifelong social behavior problems," says study senior author Regina Sullivan, Ph.D. "We can take this same approach to explore other areas of brain development, such as memory, learning, and threat recognition," adds Sullivan, a professor in the Department of Child and Adolescent Psychiatry at NYU Langone.

For the study, publishing online Oct. 26 in the journal *Neuron*, the research team observed the behavior of hundreds of rat pups. Some rodent mothers were provided limited materials with which to build a nest. In a series of social behavior tests, the study authors measured the length of time pups approached their mothers or peers after five days of living in these stressful conditions. According to the findings, the longer the stress exposure went on, the less often the pups would approach their mothers.

To examine the role of dopamine during these early life experiences, researchers used drugs that block the chemical's release in the brain. They also stimulated dopamine release in individual brain cells using light to test the impact of the chemical on social [behavior](#) after distress.

Sullivan says the research team next plans to expand the investigation to other brain areas involved in processing threat and reward.

She cautions that the study only explored the effect of a single chemical in one brain pathway, noting that [social behavior](#) involves an intricate network of cells and other pathways that still needs to be uncovered.

**More information:** Maya Opendak et al, Bidirectional control of infant rat social behavior via dopaminergic innervation of the basolateral amygdala, *Neuron* (2021). DOI: 10.1016/j.neuron.2021.09.041

Provided by NYU Langone Health

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