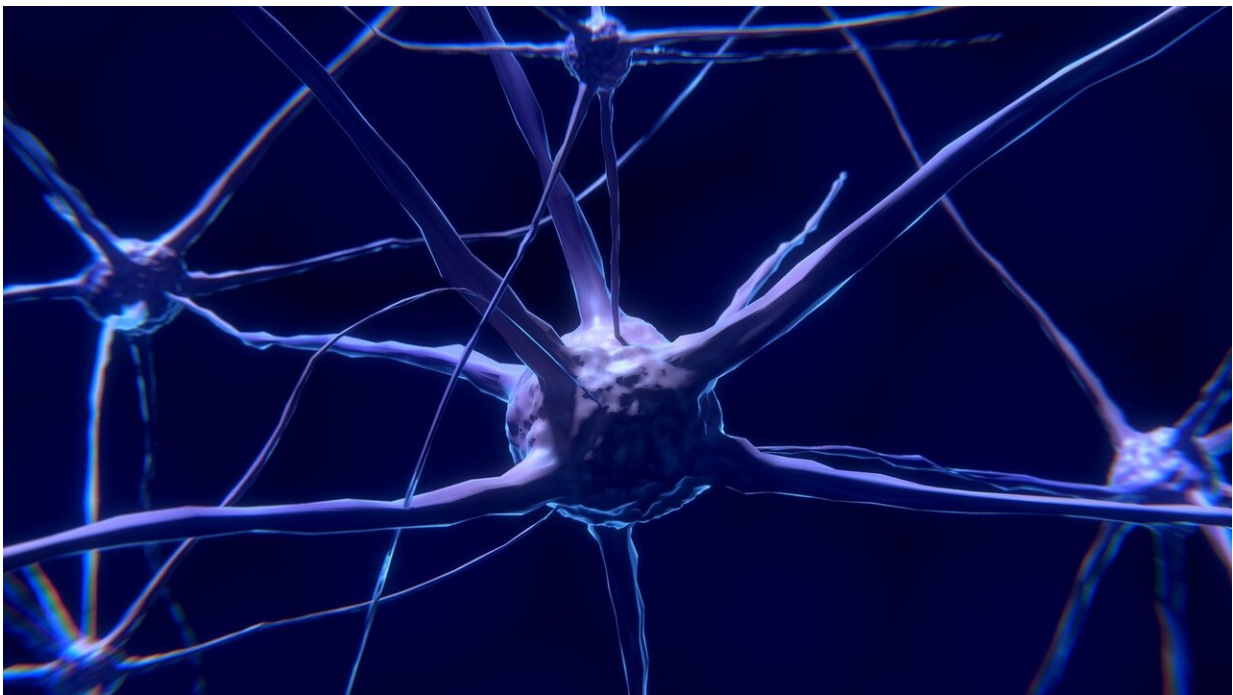


Eating for hunger or pleasure? Regulating these feeding behaviors involves different brain circuits

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Many times we eat, not because we are hungry, but because of social pressures or because the food is so appetizing, that, even though we are full, we just want another bite.

Overeating, whether it is guided by hunger or pleasure, typically leads to obesity, which affects about 42% of the adults in the U.S., according to the Centers for Disease Control and Prevention. Looking to contribute to the development of effective treatments for obesity, an international team led by researchers at Baylor College of Medicine investigated in an animal model how the brain regulates feeding triggered by hunger or other factors.

Led by Dr. Yong Xu, professor of pediatrics—nutrition and molecular and [cellular biology](#) at Baylor, the team discovered that although the brain regulates both types of feeding [behavior](#) through serotonin-producing neurons in the midbrain, each type of feeding is wired by its own independent circuit that does not influence the other type of feeding. The researchers also identified two serotonin receptors and two ion channels that can affect the feeding behaviors, opening the possibility that modulating their activities might help regulate overeating. The study appears in the journal *Molecular Psychiatry*.

Mapping the roads that control feeding behavior in the brain

Xu and his colleagues identified two distinct brain circuits formed by serotonin-producing neurons in the midbrain. One of the circuits extends to the hypothalamus, while the other projects into another region of the midbrain. These circuits play very distinct roles in regulating feeding.

"We discovered that the circuit that projects to the hypothalamus primarily regulates hunger-driven feeding, but does not influence the non-hunger driven feeding behavior," Xu said. "The other circuit that projects into the midbrain regulates primarily the non-hunger driven feeding, but not the feeding behavior triggered by hunger. This indicates that, at the circuit level, the brain wires the two types of feeding behavior differently."

The other significant contribution of this work refers to the identification of potential molecular targets associated with the circuits that could be used to treat overeating.

"One potential target is serotonin receptors, which are molecules that mediate the functions of the neurotransmitter serotonin produced by the neurons," Xu explained. "We found that two receptors, serotonin 2C receptor and serotonin 1B receptor, are involved in both types of feeding behavior. Our data suggests that combining compounds directed at both [receptors](#) might produce a synergistic benefit by suppressing feeding."

In addition, the team identified ion channels associated with the circuits that also might offer an opportunity to regulate the [feeding behaviors](#). "One is the GABA A receptor, a chloride channel, found to be important in regulating [serotonin circuits](#) during hunger-driven feeding, but not during non-hunger driven feeding," Xu said.

The other is a potassium channel that influences feeding triggered by hunger-independent cues, but not hunger-driven feeding. "There is a clear segregation of these two ion channels," Xu said. "They have distinct functions in feeding behavior, which suggests they also could be target candidates to regulate overeating."

The findings have encouraged the researchers to conduct future studies to identify more molecules that could modulate the activity of the [ion channels](#) to produce anti-overeating effects in animal models. "We also want to explore how external factors related to nutrition might affect ion channel functions at the molecular level," Xu said.

More information: Yanlin He et al, 5-HT recruits distinct neurocircuits to inhibit hunger-driven and non-hunger-driven feeding, *Molecular Psychiatry* (2021). [DOI: 10.1038/s41380-021-01220-z](https://doi.org/10.1038/s41380-021-01220-z)

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