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Breakfast helps improve self-control, study suggests

Serotonin helps you keep a rein on your aggression, emotions

Sharon Kirkey

Canwest News Service

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New research suggests why skipping breakfast before work is a bad idea: A nutrient in food is critical for keeping aggression and other emotions in check.

The findings by University of Cambridge scientists suggest that serotonin -- a chemical that brain cells use to communicate with one another -- helps the brain regions involved in self-control do their job.

The brain makes serotonin from tryptophan, an amino acid obtained exclusively through diet, especially cheese, poultry, meat, oats and chocolate.

"The brain requires certain nutrients to make chemicals that are essential for proper functioning," says Molly Crockett, a Gates Scholar at the University of Cambridge Behavioral and Clinical Neuroscience Institute.

Serotonin has long been suspected in playing a role in aggression and emotional regulation. Certain groups, including alcoholics, people who attempt suicide and violent criminals have been shown to have abnormally low serotonin levels.

"What they may have in common is impairment in regulating their emotions in social situations or in decision-making," Crockett says.

But it's not clear if it's a cause-and-effect phenomenon. In other words, "if serotonin is playing a causal role in these kinds of behaviour."

So, Crockett's team set out to directly manipulate serotonin levels in people's brains, and then test their reaction to what they perceived as unfairness.

"Resisting aggressive impulses may be difficult, but successfully navigating social life sometimes requires self-regulation in the face of perceived injustice," Crockett and her colleagues write in an article published in Science Express.

The study involved 20 healthy volunteers who fasted overnight and then were brought into the lab the next morning. In one experiment the group was given a protein shake that contained all amino acids, except tryptophan. In another, it was given the same shake but with a few added grams of tryptophan.

After waiting five hours for the drink to digest and exert its effects on the brain, the volunteers played the Ultimatum Game, where one player proposes a way to split a sum of money with the other partner. If he accepts, both players are paid

accordingly. But if the offer is rejected, neither one gets paid.

"What's interesting in this game is that if you do the math and look at what's happening in terms of financial gain, no one should ever reject an offer because it means they don't get any money," Crockett says.

Normally, people tend to reject about half of all offers less than 20 to 30 per cent of the total stake. But when volunteers were depleted of serotonin, the rejection rates increased to more than 80 per cent.

"That suggests more than financial gain is being taken into account," Crockett says. Writing in *Science Express*, the team says the results suggest that lowering serotonin levels made people more likely to retaliate against what they saw as unfair offers, even if it meant they lost more.

"Because we know a lot about what brain regions are involved in this kind of decision making, namely the prefrontal cortex and more emotional regions of the brain, this gives us some clues as to where serotonin is exerting its effects in the brain," Crockett says. It may explain why people feel edgy, aggressive and more willing to take on others when they haven't eaten, she says. "Changes in diet and stress cause our serotonin levels to fluctuate naturally, so it's important to understand how this might affect our everyday decision-making."

More importantly, it may explain why people with anxiety, depression and other mood disorders linked with low serotonin "might benefit from therapies that teach them strategies for regulating their emotions, particularly in social situations."

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