

High blood sugar causes brain changes that raise depression risk

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Researchers have found a possible biological reason why people with diabetes are prone to depression. A new study shows that high blood glucose (sugar) levels in patients with Type 1 diabetes increase the levels of a brain neurotransmitter associated with depression, and alter the connections between regions of the brain that control emotions. The results will be presented Sunday at the joint meeting of the International Society of Endocrinology and the Endocrine Society: ICE/ENDO 2014 in Chicago.

"It was traditionally thought that patients with Type 1 or Type 2 diabetes have higher rates of depression than their nondiabetic peers because of the increased stress of managing a complex chronic disease," said study co-investigators Nicolas Bolo, PhD, from Beth Israel-Deaconess Medical Center, and Donald Simonson, MD, MPH, ScD from Brigham and Women's Hospital, both in Boston. "Our results suggest that [high blood glucose](#) levels may predispose patients with Type 1 diabetes to depression through biological mechanisms in the brain."

The researchers studied 19 adults who were not depressed: eight with Type 1 diabetes (three men and five women, with an average age of 26) and 11 healthy controls (six men and five women, whose average age was 29). They used a type of [magnetic resonance imaging](#) (MRI), called functional MRI, to measure brain activity, as well as magnetic resonance spectroscopy to measure the level of glutamate, a brain neurotransmitter linked to depression at high levels. Subjects underwent brain imaging when their blood sugar level was normal (90 to 110 milligrams per deciliter, or mg/dL) and after a continuous infusion of glucose, which moderately elevated their blood sugar (180 to 200 mg/dL).

Bolo explained how acutely raising the [blood sugar level](#) reduced the strength of the connections among regions of the brain involved in self-

perception and emotions to a greater degree in [diabetic patients](#) than in healthy control subjects. The strength of these connections in the brain was reportedly also lower in diabetic patients with poor long-term glucose control, as shown by a high hemoglobin A1c level, compared with diabetic subjects in good control, who had a low hemoglobin A1c.

In addition, acutely raising the [blood glucose level](#) elevated the neurotransmitter glutamate, in an area of the brain responsible for controlling emotions, in patients with Type 1 diabetes but not in healthy individuals, the authors reported.

These changes in the brain increase the risk of developing depression, according to Simonson. Diabetic patients reported worse scores on a depression questionnaire than did the controls, but they were well below the range for major depression, he noted.

"Our findings may enable the development of more targeted approaches to treating [depression](#) in diabetes," Bolo stated.

Provided by The Endocrine Society

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