

Study shows dietary fat can affect glucose levels and insulin requirements in type 1 diabetes

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In a study of patients with type 1 diabetes, Joslin researchers found that dietary fat can affect glucose levels and insulin requirements. These findings, which appeared in the April edition of *Diabetes Care*, have major implications for the management of type 1 diabetes.

Research has shown that dietary fat and [free fatty acids](#) (FFAs) impair [insulin sensitivity](#) and increase [glucose production](#). Most studies have focused on the role of fat in the development of type 2 diabetes. However, studies of people with type 1 diabetes have shown that higher-fat pizza meals cause hyperglycemia hours after being consumed.

In reviews of continuous [glucose monitoring](#) and food log data from adult patients with type 1 diabetes, Joslin clinicians observed that "several hours after eating high-fat meals, [glucose levels](#) went up," says study lead author Howard Wolpert, MD, Senior Physician in the Joslin Clinic Section on Adult Diabetes and the Director of the [Insulin Pump](#) Program at Joslin. "We wanted to determine the underlying cause of these unexplained fluctuations."

Seven participants (adults with type 1 diabetes with an average age of 55) successfully completed the study. They spent two days at Beth Israel Deaconess Medical Center eating carefully controlled meals and having their glucose and [insulin](#) levels monitored.

All breakfasts and lunches featured identical low-fat content. The two dinners had identical carbohydrate and [protein content](#) but one was low-fat and the other high-fat. For two 18-hour periods beginning before dinner, participants had their insulin automatically regulated by a closed-loop system and their glucose and plasma insulin levels tested at frequent intervals.

Study results showed that participants required more insulin after eating the high-fat dinner than the low-fat dinner (12.6 units compared to 9 units). In contrast, the two breakfast meals required similar insulin doses. Despite the increased insulin, participants had greater hyperglycemia after the high-fat dinner with insulin levels elevated five to ten hours after the meal. The average increase in insulin was 42 percent with significant individual differences.

"These findings highlight the limitations of basing mealtime insulin dosing for type 1 diabetes solely on carbohydrate intake," says Dr. Wolpert. "We need to consider fat as well as carbohydrates in insulin dosing calculations as well as in nutritional recommendations."

Dr. Wolpert and the research team are about to start a new study funded by the Juvenile Diabetes Research Foundation that aims to define optimal insulin dosages for higher-fat meals. Participants will eat controlled high-fat meals and receive increasingly higher doses of insulin until the optimum dose is determined. "We are looking to identify individual patient characteristics that influence how much additional insulin individuals with [type 1 diabetes](#) need to cover high-fat meals," he says. "As we learn more about how dietary fat affects insulin control, we will apply our findings to improve treatment recommendations and outcomes for patients with diabetes."

They are also planning an intervention study to assess whether reducing fat intake would optimize glucose control. In the coming months, Dr. Wolpert also anticipates developing new guidelines for clinicians and patients to enable them to determine whether high-fat foods are a factor in glucose control and make appropriate nutritional changes.

Provided by Joslin Diabetes Center

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