

High-energy breakfast with low-energy dinner helps control blood sugar in people with type 2 diabetes

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A small new study published in *Diabetologia* (the journal of the European Association for the Study of Diabetes) shows that, in people with type 2 diabetes, those who consume a high energy breakfast and a low energy dinner have better blood sugar control than those who eat a low energy breakfast and a high energy dinner. Thus adjusting diet in this fashion could help optimise metabolic control and prevent complications of type 2 diabetes. The authors of the study include Professor Daniela Jakubowicz and Professor Julio Wainstein, Wolfson Medical Center, Tel Aviv University, Israel, Professor Bo Ahren, Lund University, Sweden and Professor Oren Froy Hebrew University of Jerusalem, Israel.

Previous work by this group has shown that high energy breakfast with low energy dinner (the B diet) reduced post-meal blood glucose spikes (post-prandial glycaemia) in obese non-diabetic individuals, when compared with a low energy breakfast and high energy dinner diet (the D diet). This new randomised study included 18 individuals (eight men, 10 women), with type 2 diabetes of less than 10 years duration, an age range 30-70 years, body mass index (BMI) 22-35 kg/m², and treated with metformin and/or dietary advice (eight patients with diet alone and 10 with diet and metformin). Patients were randomised to either the B diet or the D diet daily for 1 week. The B diet contained 2946 kilojoule (kJ) breakfast, 2523 kJ lunch, and 858kJ dinner. The D diet contained the same total energy but arranged differently: 858 kJ breakfast, 2523 kJ lunch, and 2946 kJ dinner. The larger of the two meals included milk, tuna, a granola bar, scrambled egg, yoghurt and cereal, while the smaller meal contained sliced turkey breast, mozzarella, salad and coffee.

Breakfast was taken at 0800H AM, lunch at 1300H PM, and dinner at 1900H PM. Patients consumed

their diets at home for 6 days before the sampling day. On the 7th day (sampling day), each group consumed their assigned meal plan in the clinic, and blood samples were collected just before breakfast (0 min) and at 15, 30, 60, 90, 120, 150 and 180 min after eating commenced. Blood sampling was repeated at the same time points after lunch and dinner. Post-meal levels of glucose were measured in each participant, as well as levels of insulin, c-peptide (a component of insulin), and glucagon-like-peptide 1 hormone (GLP-1 and also known as incretin: an indicator of glucose metabolism that stimulates insulin release). Two weeks later, patients were crossed over to the other diet plan, and the tests repeated.

The results showed that post-meal glucose levels were 20% lower and levels of insulin, C-peptide and GLP-1 were 20% higher in participants on the B diet compared with the D diet. Despite the diets containing the same total energy and same calories during lunch, lunch in the B diet resulted in lower [blood glucose](#) (by 21-25%) and higher insulin (by 23%) compared with the lunch in the D diet.

"These observations suggest that a change in meal timing influences the overall daily rhythm of post-meal insulin and incretin and results in a substantial reduction in the daily post-meal glucose levels," says Professor Froy. "A person's meal timing schedule may be a crucial factor in the improvement of glucose balance and prevention of complications in type 2 diabetes and lends further support to the role of the circadian system in metabolic regulation."

Professor Jakubowicz adds: "The mechanism of better glucose tolerance after high-energy breakfast than after an identical dinner may be in part the result of clock regulation that triggers higher beta cell responsiveness and insulin secretion in the

morning, and both a lower rate of breakdown of insulin by the liver and the increase in insulin-mediated muscle glucose uptake in the morning. Thus, recommending a higher energy load at breakfast, when beta cell responsiveness and insulin-mediated muscle glucose uptake are at optimal levels, seems an adequate strategy to decrease post-meal [glucose](#) spikes in patients with type 2 diabetes."

She concludes: "High energy intake at breakfast is associated with significant reduction in overall post-meal [glucose levels](#) in diabetic patients over the entire day. This dietary adjustment may have a therapeutic advantage for the achievement of optimal metabolic control and may have the potential for being preventive for cardiovascular and other complications of [type 2 diabetes](#)."

More information: *Diabetologia* [DOI: 10.1007/s00125-015-3524-9](#)

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