

Study offers insights on how the timing of dinner and genetics affect individuals' blood sugar control

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Blood sugar control, which is impaired in individuals with diabetes, is affected by various factors—including the timing of meals relative to

sleep as well as levels of melatonin, a hormone primarily released at night that helps control sleep-wake cycles. In research published in *Diabetes Care*, a team led by investigators at Massachusetts General Hospital (MGH), Brigham and Women's Hospital (BWH) and the University of Murcia in Spain conducted a clinical trial to look for connections between these two factors.

"We decided to test if late eating that usually occurs with elevated melatonin levels results in disturbed [blood sugar control](#)," says senior author Richa Saxena, Ph.D., a principal investigator at the Center for Genomic Medicine at MGH.

For the randomized crossover study that included 845 adults from Spain, each participant fasted for eight hours and then for the next two evenings had first an early meal and then a late meal relative to their typical bedtime. The investigators also analyzed each participant's genetic code within the melatonin receptor-1b gene (MTNR1B) because previous research has linked a variant (called the G-allele) in MTNR1B with an elevated risk of type 2 diabetes.

"In natural late eaters, we simulated early and late dinner timing by administering a glucose drink and compared effects on blood sugar control over two hours," explains Saxena. "We also examined differences between individuals who were carriers or not carriers of the genetic variant in the melatonin receptor."

The team found that melatonin levels in participants' blood were 3.5-fold higher after the late dinner. The late dinner timing also resulted in lower insulin levels and higher blood sugar levels. (This connection makes sense because insulin acts to decrease blood sugar levels.) In the late dinner timing, participants with the MTNR1B G-allele had higher blood sugar levels than those without this genetic variant.

"We found that late eating disturbed blood sugar control in the whole group. Furthermore, this impaired glucose control was predominantly seen in genetic risk variant carriers, representing about half of the cohort," says lead author Marta Garaulet, Ph.D., a professor of physiology and nutrition in the Department of Physiology at the University of Murcia.

Experiments revealed that the high melatonin levels and carbohydrate intake associated with late eating impairs blood sugar control through a defect in insulin secretion.

"Our study results may be important in the effort towards prevention of type 2 diabetes," says co-senior author Frank A.J.L. Scheer, Ph.D., MSc, director of the Medical Chronobiology Program at BWH. "Our findings are applicable to about a third of the population in the industrialized world who consume food close to bedtime, as well as other populations who eat at night, including shift workers, or those experiencing jetlag or night eating disorders, as well as those who routinely use melatonin supplements close to food intake."

The authors note that for the general population, it may be advisable to abstain from eating for at least a couple of hours before bedtime.

"Genotype information for the melatonin receptor variant may further aid in developing personalized behavioral recommendations," says Saxena. "Notably, our study does not include patients with diabetes, so additional studies are needed to examine the impact of food timing and its link with melatonin and receptor variation in patients with diabetes."

More information: Marta Garaulet et al, Interplay of Dinner Timing and MTNR1B Type 2 Diabetes Risk Variant on Glucose Tolerance and Insulin Secretion: A Randomized Crossover Trial, *Diabetes Care* (2022). [DOI: 10.2337/dc21-1314](https://doi.org/10.2337/dc21-1314)

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