

# After Dinner Diabetes

## Eating close to bedtime increases risk of diabetes

*Eating late at night can cause us to gain weight. There is a multitude of reasons for this. I don't think any of us reaches for the celery for a snack at night. But is it as simple as eating junk before bed causes us to gain weight? What is the mechanism for weight gain and possible increased risk of diabetes with late-night eating? How long should we wait after eating to go to bed? The hormonal interaction behind this isn't what we might think and may have interest especially for people who use melatonin supplements to help with sleep.*



### Abstract

**OBJECTIVE:** We tested whether the concurrence of food intake and elevated concentration of endogenous melatonin, as occurs in late eating, results in impaired glucose control, in particular in carriers of the type 2 diabetes-associated G allele in the melatonin receptor-1b gene (MTNR1B).

**RESEARCH DESIGN AND METHODS:** In a Spanish natural late-eating population, a randomized, crossover study was performed. Each participant (n = 845) underwent two evening 2-h 75-g oral glucose tolerance tests following an 8-h fast: an early condition scheduled 4 h prior to habitual bedtime (“early dinner timing”) and a late condition scheduled 1 h prior to habitual bedtime (“late dinner timing”), simulating an early and a late dinner timing, respectively. Differences in postprandial glucose and insulin responses between early and late dinner timing were determined using incremental area under the curve (AUC) calculated by the trapezoidal method.

**RESULTS:** Melatonin serum levels were 3.5-fold higher in the late versus early condition, with late dinner timing resulting in 6.7% lower insulin AUC and 8.3% higher glucose AUC. In the late condition, MTNR1B G-allele carriers had lower glucose tolerance than noncarriers. Genotype differences in glucose tolerance were attributed to reductions in  $\beta$ -cell function (P for interaction, Pint glucose area under the curve = 0.009, Pint corrected insulin response = 0.022, and Pint Disposition Index = 0.018).

**CONCLUSIONS:** Concurrently high endogenous melatonin and carbohydrate intake, as typical for late eating, impairs glucose tolerance, especially in MTNR1B G-risk allele carriers, attributable to insulin secretion defects.

*This study was designed to test if increased food intake at times of increased melatonin secretion would result in impaired glucose control. The researchers enrolled 845 adults between the ages of 18-70 without diabetes and used a glucose drink to simulate early (4 hours before bedtime) and late (1 hour before bedtime) eating. They measured glucose and insulin levels after drinking the solution. They found that melatonin levels were 3.5 times higher in the late versus early timing. The result was lower insulin output and higher glucose levels for the late eating subjects. This was especially prevalent for people who are carriers of a specific melatonin receptor gene which is found in about 50% of people. Eating dinner close to bedtime, when our endogenous melatonin levels are high is associated with decreased insulin secretion and decreased glucose tolerance. This combination increases the risk of type 2 diabetes.*

*How does melatonin affect glucose metabolism? Melatonin is a hormone released at night that helps control the sleep-wake cycle. It typically rises 2 hours before bedtime. A recent discovery of a type-2 diabetes-associated melatonin receptor gene (MTNR1B) suggests that melatonin may play a key role in glucose metabolism as well.*

*What does this mean for us? We should avoid eating within 2 hours of bedtime (I would recommend 3 hours), avoid high carbohydrate meals or snacks close to bedtime, and avoid taking melatonin supplements within 2 hours of eating.*

Interplay of Dinner Timing and MTNR1B Type 2 Diabetes Risk Variant on Glucose Tolerance and Insulin Secretion: A Randomized Crossover Trial. *Diabetes Care* 2022; dc211314. <https://doi.org/10.2337/dc21-1314>.