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What You Eat First During Meals Can Lower Glucose by 40%

Analysis by Dr. Joseph Mercola Fact Checked | July 04, 2022

STORY AT-A-GLANCE

- You can consume the same foods — same calories, same total carbs, same nutrients — and have drastically different metabolic effects depending on what you eat first
- Eating carbohydrates last is best and may reduce insulin and glucose levels compared to consuming them first
- In a study, total glucose decreased by 38% when protein and vegetables were consumed first, compared to a carbs-first meal
- Mean glucose levels were 1 mmol/L lower when carbs were consumed last compared to the typical meal, in which protein, fat and carbs are consumed at the same time
- The beneficial effects of food order on glucose levels were so powerful that researchers deemed them comparable to the effects of drugs targeting postprandial glucose

What you eat is quite possibly the most important strategy for optimizing your metabolic health and reducing your risk of diseases like Type 2 diabetes. However, the order in which you eat your food also matters, such that you can consume the same foods — same calories, same total carbs, same nutrients — and have drastically different metabolic effects depending on what you eat first.

In the video above, Dr. Jason Fung, a nephrologist (kidney specialist) and author of several books, including "The Diabetes Code: Prevent and Reverse Type 2 Diabetes Naturally," explains how you can get a more beneficial response, including reducing

insulin and glucose, by frontloading protein and fats in your meal and leaving the carbs for later.[1]

Eat Carbs Last for Better Health

It's previously been found that consuming whey protein prior to a meal reduces postmeal glucose levels.[2] Building on this, a pilot study by researchers with Weill Cornell Medical College in New York City revealed that food order also has a significant impact on postprandial (or post-meal) glucose and insulin levels.[3]

The study included 11 overweight or obese adults with Type 2 diabetes, who fasted for 12 hours overnight and then consumed the same meal on two separate days, one week apart. All that differed was the order of the meal.

On the first day, the subjects ate carbohydrates, consisting of ciabatta bread and orange juice, first. Fifteen minutes later, they consumed the protein component (skinless grilled chicken breast) and vegetables (a salad with Italian vinaigrette dressing and steamed broccoli with butter).

A week later, the food order was reversed, with the vegetables and protein eaten first, followed by the carbohydrates last. Better outcomes were achieved when the carbs were consumed last. Specifically, postmeal glucose levels decreased by 28.6%, 36.7% and 16.8% after 30, 60 and 120 minutes, respectively when vegetables and protein comprised the first part of the meal. Postprandial insulin levels were also significantly lower in this scenario.

The beneficial effects of food order on glucose levels were so powerful that the researchers deemed them "comparable to that observed with pharmacological agents that preferentially target postprandial glucose."[4] "Moreover, the reduced insulin excursions observed in this experimental setting suggest that this meal pattern may improve insulin sensitivity," they suggested, adding:

> *"In contrast to conventional nutritional counseling in diabetes, which is largely restrictive and focuses on "how much" and "what not to eat," this pilot study*

suggests that improvement in glycemia may be achieved by optimal timing of carbohydrate ingestion during a meal."

Food Order Matters in Prediabetes

Worldwide, 463 million adults have Type 2 diabetes, a number that's expected to increase to 700 million by 2045 and doesn't account for the many others who have prediabetes, which increases the risk of developing Type 2 diabetes, heart disease and stroke.[5] Approximately 1 in 3 U.S. adults, or 96 million, have prediabetes, more than 80% of whom don't know they have it.[6]

Changing food order "presents a novel, simple behavioral strategy to reduce glycemic excursions in prediabetes," according to a study published in the journal Diabetes, Obesity & Metabolism.[7] The study involved 15 participants with prediabetes who consumed the same meal on three days in random order:

- Carbohydrate first, followed 10 minutes later by protein and vegetables (CF)
- Protein and vegetables first, followed 10 minutes later by carbohydrate (PVF)
- Vegetables first followed by protein and carbohydrate (VF)

Total glucose was decreased by 38% following the PVF meal compared with CF, while incremental glucose peaks were attenuated by more than 40% in the PVF and VF meals, compared with CF.

"The CF meal pattern demonstrated marked glycemic variability whereas glucose levels were stable in the PVF and VF meal conditions," the researchers noted,[8] explaining that simply by altering food order to consume carbohydrates last it could help to mitigate the metabolic effects of carbohydrates.[9]

Consuming Carbs Last Benefits Type 1 Diabetes

Even among children with Type 1 diabetes, consuming carbohydrates at the end of the meal was beneficial. Twenty patients with Type 1 diabetes aged 7 to 17 years were included in the study.[10] They consumed two meals in random order. For the first meal, the protein and fat components were consumed first, followed 15 minutes later by the carbohydrates.

In the other meal, protein, fat and carbohydrates were consumed together, the way they would be in a typical meal. Mean glucose levels were 1 mmol/L lower when carbs were consumed last compared to the typical meal. Fung explained:[11]

> *"This might mean a lot of things, including you need less insulin, which might lead to less weight gain overall because we know that those high glucose levels, those high insulin levels, are going to drive weight gain.*
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> *This actually has massive implications for the way we need to structure our meals. If eating the exact same number of calories, eating the exact same food, but simply switching the order means that we can face 40% less glucose, that means we may be able to prevent the onset of Type 2 diabetes.*
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> *We might be able to take less medications. We may be able to lose weight, because again that lower level of insulin is going to cause less weight gain. And what it means is that you really have to frontload your meals so that you're taking your protein, and your fat and your vegetables right upfront and leaving the carbohydrates to the end."*

For best results, he says, wait about 10 minutes after consuming the protein and fats before you eat the carbs, similar to the way you might eat an appetizer before your next course.

The Timing of Your Meals Also Matters

As science is increasingly showing, what you eat is not the only factor in how food affects your health. Along with food order, the timing of your meals is another important

factor. Fung is a big proponent of fasting, or what I like to refer to as time-restricted eating (TRE).

The answer for Type 2 diabetes, he believes, is to stop feeding your body sugar and burn off the sugar already in your cells, and the most effective way to do this is TRE. **In our past interview**, he explained that metabolic treatments such as TRE are the only way to resolve diabetes:

> *"It really gets to the point that you cannot follow this old paradigm [of drug treatment] because you're going to fail ... Remember, the glucose goes into the cell, and insulin resistance is when the glucose doesn't go out of the cell. So, for years we've used this paradigm of lock and key.*
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> *That is, the cell is sort of gated off. Outside the cell there's blood, and when insulin comes around it turns the key, opens the gate and glucose goes in. So, if insulin is there, why is the glucose not going in? ... You can measure the insulin and the insulin level is high. You can look at the insulin receptor, the gate is completely normal.*
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> *So, [conventional medicine] said something like, 'Well, maybe there's something gumming up the mechanism. It's stuck in the lock so it doesn't open properly, therefore the glucose can't get into the cell.' There's a huge problem with this sort of paradigm, because if that is happening, the cell has no glucose and should be starving.*
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> *You should be losing lots of weight; you'd have a very thin liver. All your fat should just melt away, because if you think about untreated Type 1 diabetes, where you don't have enough insulin, that's exactly what happens. The cell literally starves and everything just wastes away ... But that's not what's happening here.*
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> *In Type 2 diabetes you see that people are generally obese, they have large abdomens ... What's happening instead is that it's actually an overflow syndrome. The cell can't accept any more glucose because it's jam packed full*

of glucose already. That's the reason you have insulin resistance. Insulin is trying to move glucose into the cell but the cell is full ... So, it's really an overflow mechanism ...

That's also why your liver is full — it's a big fatty liver. The liver is busy trying to get rid of all this glucose by turning it into fat ... Now, if Type 2 diabetes and insulin resistance are the same sort of thing, it's really about too much sugar. That's the bottom line.

And if you understand that the whole problem is too much sugar, then the solution is not to use more insulin to jam more glucose into an already full cell. The key is to get rid of it all. So, what you want to do is: 1) Don't put more sugar into your system, because you have too much sugar in already, and 2) Burn it off."

Limit Your Eating Window to Six to Eight Hours Per Day

While fasting may sound intimidating, TRE is manageable as it involves limiting your eating window to six to eight hours per day instead of the more than 12 hours that most people do. TRE promotes insulin sensitivity and improves blood sugar management by increasing insulin-mediated glucose uptake rates,[12] which is important for resolving Type 2 diabetes.

In another study, when 15 men at risk of Type 2 diabetes restricted their eating to even a nine-hour window, they lowered their mean fasting glucose, regardless of when the "eating window" commenced.[13] A 2022 review also highlighted many of the benefits of TRE for the prevention of Type 2 diabetes, reveling that it:[14]

- Produces mild weight loss of 1% to 4%
- Reduces fasting insulin
- Improves insulin sensitivity in people with prediabetes or obesity
- Improves glucose tolerance

- Reduces oxidative stress

So simply by restricting your eating window to six to eight hours per day, and consuming carbs at the end of your meal, you may be able to improve your metabolic health significantly. This isn't to say that food quality doesn't matter, particularly when it comes to ultraprocessed foods.

Linoleic acid (LA) in seed oils — commonly known as vegetable oils — plays a major role in producing chronic diseases like diabetes.[15] Linoleic acid is found in virtually every processed food, including restaurant foods, sauces and salad dressings, and even "healthy" foods like chicken and pork. So in addition to embracing TRE and optimizing food order, reducing LA is essential for diabetes prevention and management.

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