Team finds individualized diets are most effective for managing blood sugar levels

8 February 2019

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An individualized diet based on a person's genetics, microbiome and lifestyle is more effective in controlling blood glucose (sugar) levels than one that considers only nutritional composition of food, Mayo Clinic researchers have confirmed. The research published in the Feb. 8 edition of *JAMA Network Open* demonstrates that each person's body responds differently to similar foods, due to the unique composition of each person's gut microbiome—the complex community of trillions of bacteria within the digestive track.

The goal of this research was to develop a model for predicting glycemic response to foods—how a person's blood sugar level spikes or stays the same after eating. The study finds that an individualized approach taking into account each person's gut microbiome, age, diet, physical activity and other factors more accurately predicts blood glucose levels than glycemic index predictions based on carbohydrates or calories.

"We've shown that our model, which considers an individual's microbiome in addition to other factors, is better for predicting blood glucose response after meals. The standard approach of counting carbohydrates and calories does not work as well because it considers only the characteristics of food . It fails to factor in the unique microbiome and lifestyle of each person," says Helena Mendes Soares, Ph.D., lead author on the study.

Glucose, which comes from the foods eaten, is the main source of energy for the body. Controlling blood glucose—the amount of sugar in the blood—is important to preventing disorders such as diabetes, heart disease, obesity, vision loss and kidney disease. This study shows how each person's blood sugar level responds uniquely to food. It sheds light on why some people can eat foods like fruit and feel energized, while others eat fruit and experience a blood sugar spike that eventually makes them feel tired.

"This study is the first critical step in defining and proving the value of a personalized diet. As a clinician, I have seen that my patients do not respond to the same foods the same way—just like not all weight-loss diets work for all people the same," says Heidi Nelson, M.D., a co-author on the study. "For people who want to manage their blood glucose levels, we have a new model that predicts their unique response to foods."

The research

Mayo Clinic followed 327 healthy people, mostly from the Midwest, for six days. Each person submitted a stool sample for genetic sequencing of the unique microbial makeup of the gut microbiome . Participants ate a standard diet of bagels and cream cheese for breakfast, then consumed foods of their own choosing the rest of the day. They kept a diary of their food intake, exercise and rest, and wore a blood glucose monitor that tracked their glycemic responses to food.

Researchers found their model, which accounted for age, lifestyle and genetic differences in each

person's microbiome, accurately predicted blood sugar response to food 62 percent of the time. This was far superior to the 40 percent accuracy for predictions based on carbohydrates alone and 32 percent based on calories alone.

"The current models of predicting blood glucose levels perform well, but they tend to bucket everything, like fats and carbohydrates, into one category. With our individualized model, people no longer have to give up all foods within a certain category," says Purna Kashyap, M.B.B.S., co-director of the Mayo Clinic Center for Individualized Medicine Microbiome Program and an author on the study. "It allows them to choose specific foods within certain categories that fit well with their microbiome."

This research, done in collaboration with DayTwo Inc., confirmed findings of a similar study conducted at the Weizmann Institute of Science in Israel.

"The similarity of results across Israel and the United States suggests that the individualized model works across diverse populations, despite personal traits and microbiomes that tend to vary due to different geographic locations, genetics and behaviors," says Dr. Mendes Soares.

While this is a first step in developing personalized nutritional strategies to tackle metabolic diseases, follow-up clinical studies will be needed to assess the long-term health benefits of an individualized approach to predicting glycemic response and their importance in diabetes and obesity.

Provided by Mayo Clinic