

Algorithms to Personalize the 'Best Diet' Are Not Yet Ready for Prime Time



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Courtesy of National Cancer Institute (NCI) [1]

Type 2 diabetes is a growing problem, a complicated interaction of genetics, the gut microbiome, diet, and lifestyle. In an attempt to be pro-actively preventative, we have created new categories of “disease,” pre-diabetes where blood sugar or Hemoglobin A1c are rising but not diagnostic for diabetes. This raises a therapeutic dilemma, what to prescribe for patients beyond be more active and watch your diet?

Dietary advice revolves around two approaches, fewer calories and or fewer carbohydrates. Caloric restriction reduces weight for nearly everyone; the same is frequently true for a diet lower in carbs and higher in protein. Their impact is more muted concerning those pre-diabetes markers, blood sugar, and Hg A1c. Part of the reason that the effect is not as pronounced as we predict and hope is that genetics, diet, microbiome, and lifestyle interact and vary for everyone. Think of it as an aggregation problem, where the average, in this case, our dietary advice, does not reflect the considerable variation in the sample, that would be the general population. A new study in JAMA applies technology and algorithms to the problem.

The study looked at 327 basically healthy adults without diabetes. The participants were a reasonably homogenous collection, mean age 45, nearly 80% female and Caucasian. Their gut microbiome was sampled, and they were asked to record their regular eating habits and activity while wearing a continuous glucose monitor in the week-long study. The participants also ate four training meals with defined amounts of carbs, proteins, and fats to calibrate the effect of those foods on their blood sugar [1]. And as is often the case in today’s research, the calibrating meals along with all the other demographics, diet, activity and microbiome data were subsequently fed to

an algorithm.

As we would expect, the responses to that standardized meal varied quite a bit raising blood sugar anywhere from 6 to 94 mg/dL above baseline. And that variability was not only between individuals but for the same individual on different days. Take home lesson one, our “processing” of food is dynamic; there are no dietary injunctions that work every day let alone for everyone. And that applies for how we digest and metabolize carbs, proteins, and fats, together or individually.

The goal of the study was evaluating the predictive algorithm. It did much better than predictions based solely on calories, 34% predictive “power,” or carbohydrate content, 40%. Its predictive accuracy was roughly 66% - better but not nearly best. In fact, the results were not quite as good, but in the same ballpark, as initial studies done on an Israeli population. Take home lesson two, algorithmic personalization of our biologic consumption is more difficult than for consumption of books or durable goods. “Other participants who have eaten salmon, often eat asparagus,” is not in our near term future.

One strength of the study was that it was done on “free-living” participants going about their normal daily lives. But it required a lot more engagement by the participants in recording their activity and diet, a problem in translating this diagnostic approach into the real world. Wearing a monitor for a week is one thing, having to record your meals, even if it comes down to just taking a picture, is a lot more work; compliance may be an issue. Precision medicine remains an important goal, but here is another example of both how far we have come and need to travel still.

[1] The standard meal was a bagel and cream cheese as the first meal of the day.

Source: Assessment of a Personalized Approach to Predicting Postprandial Glycemic Responses to Food Among Individuals without Diabetes JAMA Network Open
DOI:10.1001/jamanetworkopen.2018.8102

I should note that the study was performed by Mayo Clinic in collaboration with the company developing the algorithm, DayTwo. Mayo Clinic has an equity position in that company so some might concern themselves with the integrity of their findings. Since the results are just OK, I think we can safely say that conflicts of interest had no role and that corporate “science” does not always report widely favorable results.

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[1] https://upload.wikimedia.org/wikipedia/commons/6/6d/Good_Food_Display_-_NCI_Visuals_Online.jpg