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Opinion Article

A Comparative Study on Microbiome and Metabolic Responses in Pre-diabetics

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DESCRIPTION

Diabetes and its related comorbidities are a growing worldwide health threat. They did a six-month dietary intervention in pre-diabetic people to reduce hyperglycemia and improve metabolic health. The current study looks on early diabetes signs in the 200 people who finished the trial. They discover that 166 of 2,803 assessed characteristics, including oral and gut microbial species and pathways, serum metabolites, and cytokines, alter significantly in response to a tailored postprandial glucose-targeting diet *versus* the standard of care.

These modifications include both existing hyperglycemia markers and novel traits that can now be studied as possible treatment targets. Their findings show that the microbiome mediates the influence of diet on glycemic, metabolic, and immunological measures, with changes in gut microbiome composition explaining 12.25% of the variance in blood metabolites.

Although the gut microbiome varies more than the mouth microbiome, the oral microbiome changes more at the genetic level, with trends dependent on environmental richness and species predominance in the population. In conclusion, their research reveals that dietary treatments can impact the host's microbiome, cardiometabolic profile, and immune response, and that these parameters are well connected with one another and can be used to develop new therapeutic modalities.

Pre-diabetes, defined as high blood glucose levels but below diabetes criteria, is a substantial risk factor for type 2 diabetes, as well as other comorbidities such as cardiovascular and kidney disease. Pre-diabetes has increased substantially in recent decades, affecting around 7.5% of the world's population, or 374 million people, the vast majority of whom live in low-income nations and are ignorant of their disease.

Diet is an important factor in the development of hyperglycemia and the beginning of pre-diabetes. Poor nutrition, particularly a diet high in processed meat, low-quality carbs, and sugary drinks, and low in plant-based foods, can trigger an inflammatory immune response that destroys pancreatic beta cells and produces insulin insufficiency. Glycemic dysregulation is associated with a number of metabolic pathways and processes, such as proteolysis, mitochondrial activity, *de novo* lipogenesis, and fatty acid oxidation.

Increasing research reveals that postprandial glycemic response varies greatly between individuals and that general recommendations are ineffective. Developed a machine-learning method that incorporates dietary patterns, blood parameters, anthropometrics, physical activity, and gut microbiota traits to predict individualized postprandial glycemic response to real-life meals.

The gut microbiome is thought to mediate the link between diet, metabolism, and immunity by extracting energy from meals that the host would otherwise digest and generating metabolites and cytokines. The oral microbiome has been related to hyperglycemia because elevated glucose levels promote bacterial growth and can result in chronic inflammation in periodontal tissues. Local inflammation can facilitate the passive passage of bacterial mediators into the circulation and cause systemic inflammation, which aggravates insulin deficiency.

The majority of microbiome investigations to have concentrated on species composition, however this strategy has disadvantages. For example, produce a misleading dependency between measured properties, such that one species' abundance is dependent on the measured level of another species, even if this is not actually accurate.

Furthermore, bacteria are genetically variable, with even two strains of the same species differing in their genetic makeup by up to 5%, resulting in various bacterial behaviors and impacts on the host that compositional analysis may miss. By examining the microbiome from both a species-composition and a strain-genetic standpoint, they can gain a more thorough understanding of the microbiome's various layers. In this study, they looked at how a tailored postprandial glucose-targeting diet compared to the standard of care Mediterranean Diet (MED) affected the oral and gut microbiome, metabolites, and cytokines in 200 pre-diabetic people.

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