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Children's gut bacteria linked to type 1 diabetes

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University of Florida researchers have found that the variety of bacteria in a child's digestive tract is strongly linked to whether that child develops type 1 diabetes. The connection could eventually give doctors an early test for the condition and a new way to treat the disease that afflicts more than 3 million Americans.

The cause of type 1 diabetes, formerly dubbed juvenile diabetes, has long been a baffling medical mystery. There seems to be little or no genetic element — only 15 percent of those who develop the form of diabetes have an immediate family member with the condition, meaning there is likely a trigger somewhere in the patient's environment.

According to the UF research, that trigger may be linked to bacteria that live in our digestive tracts. At birth, our digestive tracts are relatively sterile. Even as we take our first breaths, however, we begin to ingest the microbes around us.

Most of us build and maintain a healthy variety of microbes in our gut. They are essential to health, helping to break down food while offering an extra layer of protection for our delicate digestive system.

The new research has shown that type 1 diabetic children lose this balance of bacteria. While healthy children all had very similar microbial mixes, the diabetic children all had erratic combinations with less overall variety.

“Like the famous first line of Tolstoy’s ‘Anna Karenina,’ ‘All happy families are alike; each unhappy family is unhappy in its own way,’” said Eric Triplett, chairman of UF’s department of microbiology and cell science and lead author of the study, published online last week by The International Society of Microbial Ecology Journal.

The research tracked the gut bacteria of eight Finnish children — four of whom developed diabetes and four who did not — by using cutting-edge, high-speed genetic analysis to identify and quantify the bacteria present in the children’s bodily waste.

The uniformity of Finland’s gene pool, along with a higher prevalence of type 1 diabetes, makes the Finnish population ideal for genetic research on the condition, said Mark Atkinson, a type 1 diabetes researcher in UF’s department of pathology, immunology and laboratory medicine.

As the diabetic children’s disease progressed, so did the irregular makeup of their gut bacteria.

It’s not clear why the bacteria populations skew in some people. It’s also not entirely clear, Atkinson said, how that unbalanced mix contributes to the disease, which occurs when the body’s own immune system destroys insulin-producing cells in the patient’s pancreas.

One theory holds that the lack of a stable bacterial mix leaves the wall of the digestive tract weak. This allows unusually large and complex proteins into the bloodstream. These are then detected by the immune system, causing it to overact and essentially “misfire.”

In this way, the researchers say, an unstable microbial mix may contribute to other immunological diseases, such as Crohn’s disease, celiac disease and multiple sclerosis. Recent research has also shown that gut bacteria are also linked to some cases of obesity.

The bacterial mix seems to begin becoming unstable before the patient begins to show signs of the condition. Tests to evaluate gut bacteria levels could be a useful early indication of disease, and could give doctors an early jump on treatment.

Previous studies using mice have shown that introducing beneficial bacteria - such as the kind commonly found in active-culture yogurt - can help correct the microbial mix and help stave off the onset of type 1 diabetes.

“It won’t be as easy as feeding a patient yogurt,” Triplett said. “But if we could develop a system of profiling someone’s gut microbiome, then maybe we can develop a system for correcting or at least modifying it, as well.”

Provided by University of Florida