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Researchers discover link between insulin response and energy producer in pre-diabetic people

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Virginia Tech researchers have identified a biomarker in pre-diabetic individuals that could help prevent them from developing Type II diabetes.

Publishing in Clinical Epigenetics, the researchers discovered that pre-diabetic people who were considered to be insulin resistant—unable to respond to the hormone insulin effectively—also had altered mitochondrial DNA.

Researchers made the connection by analyzing blood samples taken from 40 participants enrolled in the diaBEAT-it program, a long-term study run by multiple researchers in the Fralin Translational Obesity Research Center and funded by a grant from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK).

Participants did not have diabetes or cardiovascular disease, but were pre-diabetic and showed signs of insulin resistance.

Blood samples revealed participants had lower amounts of mitochondrial DNA with a higher amount of methylation—a process that can change the expression of genes and mitochondrial copy numbers in cells—than healthy people.

Mitochondrion is responsible for converting chemical energy from food

into energy that cells can use.

"If the body is insulin resistant, or unable to respond properly to insulin, it could affect a person's mitochondrial function and overall energy levels," said Zhiyong Cheng, an assistant professor of human, nutrition, foods, and exercise in the College of Agriculture and Life Sciences and a Fralin Life Science Institute affiliate. "Mitochondrial alterations have previously been observed in obese individuals, but this is the first time we've made the molecular link between insulin resistance and mitochondrial DNA changes."

Cheng and collaborator Fabio Almeida, an assistant professor of human nutrition, foods and exercise in the College of Agriculture and Life Sciences and a Fralin Life Science Institute affiliate, think this link could be important for treating pre-diabetic individuals to prevent Type 2 Diabetes.

According to the NIDDK, more than 2 out of 3 adults are considered overweight and more than 1 out of 3 adults are considered obese. The growing epidemic of obesity is largely attributed to energy overconsumption—taking in more food calories than the body burns through physical activity.

"There is no known cure for Type 2 diabetes, and early diagnosis and intervention is critical to prevent this disease," said Almeida. "Discovery of the biomarker in obese, pre-diabetic individuals advances our understanding of how diabetes develops and provides evidence important for future diagnosis and intervention."

More information: "Design and methods of "diaBEAT-it!": a hybrid preference/randomized control trial design using the RE-AIM framework." *Contemp Clin Trials*. 2014 Jul;38(2):383-96. DOI: 10.1016/j.cct.2014.06.010

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