

Low carbohydrate diet may reverse kidney failure in people with diabetes

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Researchers from Mount Sinai School of Medicine have for the first time determined that the ketogenic diet, a specialized high-fat, low carbohydrate diet, may reverse impaired kidney function in people with Type 1 and Type 2 diabetes. They also identified a previously unreported panel of genes associated with diabetes-related kidney failure, whose expression was reversed by the diet. The findings were published in the current issue of *PLoS ONE*.

Charles Mobbs, PhD, Professor of Neuroscience and Geriatrics and Palliative Care Medicine at Mount Sinai School of Medicine, and his research team evaluated mice that were genetically predisposed to have Type 1 or 2 diabetes. The mice were allowed to develop diabetic nephropathy, or kidney failure. Half of the mice were put on the ketogenic diet, while the control group maintained a standard high carbohydrate diet. The researcher founds that after eight weeks, kidney failure was reversed in the mice on the ketogenic diet.

"Our study is the first to show that a dietary intervention alone is enough to reverse this serious complication of diabetes," said Dr. Mobbs. "This finding has significant implications for the tens of thousands of Americans diagnosed with diabetic kidney failure, and possibly other complications, each year."

The ketogenic diet is a low-carbohydrate, moderate protein, and high-fat diet typically used to control seizures in children with epilepsy. Many cells can get their energy from ketones, which are molecules produced

when the blood glucose levels are low and blood fat levels are high. When cells use ketones instead of glucose for fuel, glucose is not metabolized. Since high glucose metabolism causes kidney failure in diabetes, researchers hypothesized that the ketogenic diet would block those toxic effects of glucose. Considering the extreme requirements of the diet, it is not a long-term solution in adults. However, Dr. Mobbs' research indicates that exposure to the diet for as little as a month may be sufficient to "reset" the gene expression and pathological process leading to kidney failure.

The researchers also identified a large array of genes expressed during diabetic nephropathy not previously known to play a role in the development of this complication. These genes are associated with kidney failure as a result of the stress on cellular function. The team found that the expression of these genes was also reversed in the mice on the ketogenic diet.

Dr. Mobbs and his team plan to continue to research the impact of the ketogenic diet and the mechanism by which it reverses kidney failure in people with diabetes, and in age-related kidney failure. He believes the ketogenic diet could help treat other neurological diseases and retinopathy, a disease that results in vision loss.

"Knowing how the ketogenic diet reverses nephropathy will help us identify a drug target and subsequent pharmacological interventions that mimic the effect of the diet," said Dr. Mobbs. "We look forward to studying this promising development further."

Provided by The Mount Sinai Hospital

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