Study: Poor parental diet linked to multi-generational health risks

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ayawn@tulane.edu
(504) 247-1443

A new study from Tulane University found that the effects of malnutrition could be passed on for up to four generations, and finding that sheds light on how famine in one generation can impact the next. (Shutterstock)

You are what you eat, as the adage goes. But a new study from Tulane University found that what's missing from your diet may also impact the health of your descendants across multiple generations.

Recent research supports the idea that famine in one generation can lead to harmful genetic outcomes in the next. But questions have persisted about how many

generations could be affected when an ancestor endures a nutritional crisis.

In a study published in the journal *Heliyon*, Tulane researchers found that when paired mice were fed a low-protein diet their offspring over the next four generations had lower birthweights and smaller kidneys, leading risk factors for chronic kidney disease and hypertension.

Researchers found that correcting the diets in offspring had no impact, and subsequent generations continued to be born with low nephron counts, the vital filtration units that help kidneys remove waste from the bloodstream. Though further work remains to determine if the findings translate to humans, the outcomes underscore the potential for food scarcity or malnutrition to result in decades of adverse health outcomes.

“It’s like an avalanche,” said lead author Giovane Tortelote, assistant professor of pediatric nephrology at Tulane University School of Medicine. “You would think that you can fix the diet in the first generation so the problem stops there, but even if they have a good diet, the next generations – grandchildren, great grandchildren, great-great grandchildren – they may still be born with lower birth weight and low nephron count despite never facing starvation or a low-protein diet.”

Correcting the diet in any of the generations failed to return kidney development in offspring to normal levels.

While maternal nutrition is crucial to an infant’s development, the study found first generation offspring were negatively impacted regardless of whether the mother or the father ate a protein-deficient diet.

This novel finding of how diet can have transgenerational impact on kidney development is one of the latest in the field of epigenetics, the study of how environmental factors can impact gene expression without changing the DNA sequence.

The researchers studied four generations of offspring with nephron counts beginning to show signs of normalizing by the third and fourth generations. Tortelote said further research is needed to determine which generation returns to proper kidney development – and why the trait is passed on in the first place.

“The mother’s diet is absolutely very important, but it appears there’s also something also epigenetically from the father that governs proper kidney development,” Tortelote said.

The study also illuminates further understanding of the underlying causes of chronic kidney disease, the eighth leading cause of death in the U.S.

“If you’re born with fewer nephrons, you are more prone to hypertension, but the more hypertension you have, the more you damage the kidney, so it’s a horrible cycle, and a public health crisis that could affect people across 50 to 60 years if we apply this to humans’ lifespans,” Tortelote said. “There are two main questions now: Can we fix it and how do we fix it?”

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