Vegetarian diet benefits aren't one-size-fits-all, says study

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When it comes to determining whether a vegetarian diet is right for you, genetics are an important part of the equation, according to a new study from the University of Georgia.

For many, vegetarianism leads to health benefits like lowered cholesterol and decreased risk of heart disease and Type 2 diabetes. But for some, this specialized diet may come with a cost, the researchers said.

The work is published in the journal *PLOS Genetics*.

The study looked at how differences in genes influence how a person responds to nutrients and potential diet-related disease. It provides a strong knowledge base for improving overall health outcomes through nutrition, said lead author Michael Francis, Ph.D., a graduate from UGA's Institute of Bioinformatics. Francis was a vegetarian for seven years throughout his teens and 20s, and though he eats meat now, he said that it was one of the main reasons he chose to study nutrigenetics.

"We are building a scientific foundation for personalized nutrition, which optimizes human health at the level of the individual, instead of one-size-fits-all dietary recommendations," Francis said.

The researchers analyzed data from over 150,000 participants and identified 2,300 who followed strict parameters for a vegetarian diet to determine how genetics affect health benefits.

They found that most vegetarians had lower cholesterol across all measures, including total cholesterol, LDL and HDL levels, which can
be beneficial for heart health.

Vegetarians also had lower Vitamin D levels and higher levels of triglycerides than non-vegetarians. Vitamin D is important for bone health and immune function, and a deficiency can lead to negative health effects. Higher levels of triglycerides, which are a type of fat in the blood, can also increase risk of cardiovascular disease.

By including a genetic component to their analysis, the study found that when specific gene variants, also known as minor alleles, were present, participants saw different health outcomes. This included a variant of the gene MMAA, which relates to calcium metabolism.

While most vegetarians see decreased calcium levels, which can have noteworthy negative effect, individuals with this minor allele saw increased calcium levels. This could lead to improvements in bone health and dental health, but high levels of calcium can also have negative health effects including kidney stone development or cardiovascular issues.

Others might see an impact on their hormone levels. While the majority of vegetarians see a decrease in testosterone, a smaller group with another gene variant saw increased testosterone levels. The third significant interaction, according to the study, was a gene variant related to kidney function and kidney filtration rates. The presence of this minor allele modified the effect of vegetarianism, taking it from increasing the eGFR, or estimated glomerular filtration rate, to decreasing that filtration rate.

Highlighting these differences can help individuals find the best diet for their individual needs, Francis said.

"People with specific and immediate nutritional requirements related to
these three traits should consider being tested for the variants we describe in this manuscript and making changes accordingly," he said.

Moving forward, this study can support future nutrigenetics studies and clinical trials, helping researchers better understand the impact of diet on different groups.

The study was co-authored by Dr. Kaixiong Ye, of UGA's Department of Genetics. Additional co-authors include Drs. Kenneth Westerman and Alisa Manning, of Harvard University.

More information: Michael Francis et al, Gene-vegetarianism interactions in calcium, estimated glomerular filtration rate, and testosterone identified in genome-wide analysis across 30 biomarkers, PLOS Genetics (2024). DOI: 10.1371/journal.pgen.1011288

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