

Multiethnic Genetic Associations with Lycopene Concentrations

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Lycopene is a carotenoid found in many red and pink fruits and vegetables, such as tomatoes and grapefruits. Consumption of lycopene-containing foods and higher serum lycopene concentrations have been associated with lower risk of several chronic diseases, including cardiovascular disease and cancer. Inconsistencies in quantifying these associations may be explained by genetic variation that influences blood lycopene levels. While these associations have been evaluated in individuals of European descent, genetic effects in other populations have not been fully explored. To address this issue, Drs. Niha Zubair, Marian Neuhouser, and colleagues in the Public Health Sciences Division conducted a study to evaluate whether genetic variation is associated with serum lycopene levels across ethnic groups. As recently reported in *The Journal of Nutrition*, the researchers found three novel loci associated with serum lycopene concentrations, two of which were unique to African Americans.

Lycopene is one of the most widely consumed carotenoids in the United States. Previous studies suggesting that increased consumption of lycopene-rich foods may decrease cancer risk have been widely covered by the media, particularly for prostate cancer. "Recently, however, the presumed role for lycopene in prostate cancer prevention has been disputed," said lead author Dr. Niha Zubair. "These inconsistencies may stem from a lack of knowledge about the genetic variation in the synthesis, metabolism, and deposition of transport and binding proteins, which potentially influence blood lycopene concentrations."

To evaluate this hypothesis, the authors performed a genome-wide association study of serum lycopene levels in the Women's Health Initiative (WHI). This project included women from two genetic studies in the WHI: the Single Nucleotide Polymorphism Health Association Resource (SHARe), and the Genomics and Randomized Trials Network (GARNET). Importantly, this allowed the researchers to perform multiethnic analyses that included roughly 1,200 European American, 900 African American, and 460 Hispanic American women. "This is the first time that such a study has been conducted in a multiethnic population," said Dr. Zubair.

Some 7 million common genetic variants were screened for an association with serum lycopene levels in each group, which were then combined for multiethnic meta-analyses. In so doing, the

authors found a significant association with three variants near the *SCARB1* gene, which encodes a cholesterol membrane transporter. The strongest signal was for rs1672879, where each G allele was associated with a 9-20% decrease in serum lycopene concentrations. While the amount of decrease varied slightly by ethnicity group (see figure), the direction of effect was consistent and the association remained statistically significant after further adjustment for total serum cholesterol levels.

In the ethnicity-specific analyses, the authors additionally found several variants in two loci that were associated with serum lycopene concentrations in African Americans, but not in the other ethnic groups. This included four variants in the *SLIT3* gene and four variants in the *DHRS2* gene. These variants were monomorphic in the Hispanic and European Americans, demonstrating the importance of performing these studies in multiple ethnic groups. The authors note that previous studies have observed discrepancies between dietary intake and serum lycopene levels, and variants specific to African Americans may help explain some of this variance.

Overall, this study identified three novel loci associated with serum lycopene levels, which may help to clarify the potential impact of this common dietary component. Said Dr. Zubair, "Future studies looking at the biological function of these specific genes may provide insight into the metabolism and underlying function of lycopene in humans, which may further elucidate lycopene's influence on disease risk and health."

Other PHS researchers contributing to this project were Ms. Jingmin Liu and Drs. Charles Kooperberg, Chongzhi Di, and Ulrike Peters.

Citation:

[Zubair N, Kooperberg C, Liu J, Di C, Peters U, Neuhaus ML](#). 2015. Genetic variation predicts serum lycopene concentrations in a multiethnic population of postmenopausal women. *J Nutr*. 145(2):187-92. doi: 10.3945/jn.114.202150.

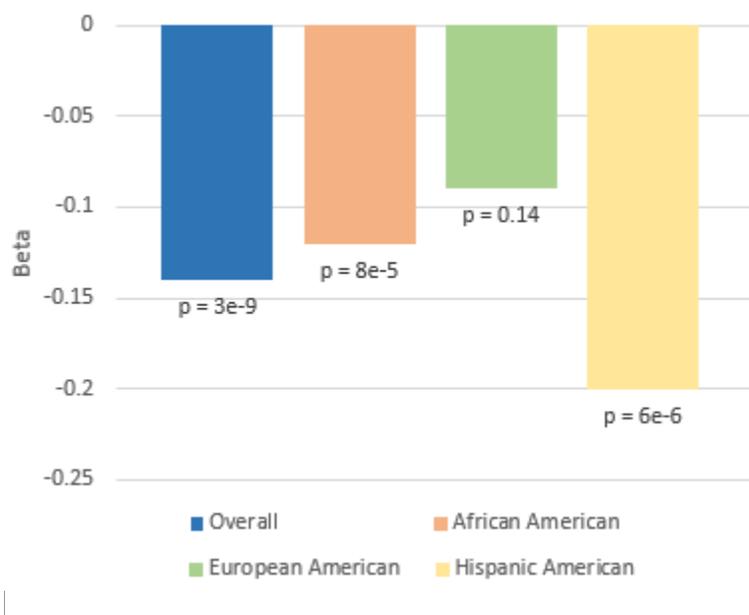


Image provided by Dr. Jonathan Kocarnik

Percent reduction in serum lycopene concentrations per G allele of rs1672879, a single nucleotide polymorphism in the SCARB1 gene.