Association of Taste-Related Genes With Diet Quality and Cardiometabolic Risk Factors Among Community-Dwelling Adults – The Framingham Heart Study

Julie Gervis,[1] Jiantao Ma,[2] Kenneth Chui,[3] and Alice Lichtenstein[1]

[1]JM USDA Human Nutrition Research Center on Aging, Tufts University; [2]Friedman School of Nutrition Science and Policy, Tufts University; and [3]Tufts University School of Medicine

Objectives: Understanding the individual-level drivers of food choices is critical for designing personalized nutrition guidance. Taste perception is one factor, yet the effects of genetic variants (SNPs) related to taste perception on diet quality and cardiometabolic risk factors (CRFs) are unknown. Thus, our aims were to determine the associations of taste-related SNPs, combined as polygenic risk scores (PRS), with diet quality, and CRFs (waist circumference, glucose, systolic and diastolic blood pressure [SBP and DBP], and log[triglyceride] [TG] and HDL levels).

Methods: Cross-sectional analyses were conducted in 6,230 Framingham Heart Study Offspring (1998–2001) and Third Generation (2002–05) participants (mean age ± SD: 50 ± 14 y; 54% female). Diet quality was estimated using food group intakes (log[sev/wk]) derived from food frequency questionnaires. Weighted PRS were derived for tastes with ≥ 2 SNPs identified from prior GWAS (32 SNPs; 19 sweet, 9 bitter, 2 umami, 1 salt, 1 sour). Higher PRS indicated more alleles for higher taste perception. Associations were assessed via linear mixed models adjusted for age, sex, population stratification and energy intake.

Results: PRS were built for sweet, bitter, and umami perception (mean PRS ± SD: 19.5 ± 2.5, 5.3 ± 1.6, and 3.1 ± 0.8, respectively). Inverse associations were identified for PRS_{bitter} and whole grains, PRS_{umami} and vegetables, and PRS_{sweet} and TG levels (β [95% CI] = −0.03 [−0.05, −0.02], −0.03 [−0.06, −0.01], and −0.008 [−0.014, −0.003], respectively) (all FDR <0.05). Exploratory analyses of individual SNPs identified associations (FDR <0.05) of sweet-related SNPs with higher fish/seafood and HDL levels, and lower TG levels; umami-related SNPs with lower vegetables; and a bitter-related SNP with lower SBP and DBP. Novel SNP-diet interactions were also identified; for example, higher fish/seafood intake was associated with lower TG levels for those with GG for salt-related SNP rs10134414 (G>A; G = higher perception), but higher TG levels for those with AA/AG (P=0.002).

Conclusions: Among community-dwelling adults, sweet-, bitter- and umami-related genes were associated with diet quality and CRFs, suggesting that taste-related genes impact food choices and may be beneficial to consider when personalizing risk reduction dietary guidance.

Funding Sources: AHA pre-doctoral fellowship #837,466 (JEG).