SNP SUMMARY: TASTE RECEPTOR TYPE 2 GENE 38 (*TAS2R38)*

Overview	Bitter taste is the most complex taste, and has been shown to influence food preferences. The discovery around the ability to taste bitter compounds was based on an individual's taste response to the chemical compound phenylthiocarbamide (PTC) and its chemical relative propylthiouracil (PROP). These chemicals taste bitter to some, however others cannot taste them or require higher concentrations to recognize their presence. The degree of taste sensitivity has been shown in some studies to be associated with the disliking/liking of bitter and sweet tastes, which influence food preferences, and has long-term health implications. Of particular clinical relevance is the impact it has on how vegetables, especially cruciferous vegetables are tasted. The bitter receptor gene (TAS2R38) was identified to be responsible for PTC bitter sensitivity. Variant alleles of the *TAS2R38* receptor gene were reported to be responsible for a well-described individual difference in the ability to taste PTC and PROP.
Name of gene	Taste receptor type 2 gene 38
Symbol of gene	*TAS2R38*
Gene database	http://www.genecards.org/cgi-bin/carddisp.pl?gene=TAS2R38
rs numbers	rs1726866 rs713598

	rs10246939
Genotypes and haplotype	The SNPs; 145 C>G, 785 C>T and 886 G>A result in 3 amino acid substitutions at codons Proline49Alanine (P49A), Alanine262Valine (A262V), and Valine2961isoleucine (V2961I). Bitter tasters are defined by the following three amino acids inherited together (*P*roline–*A*lanine–*V*aline) PAV, whereas "non-tasters" have the haplotype (*A*lanine–*V*aline–*I*soleucine) AVI.
Haplotype nomenclature	TAS2R38 PAV for tasters and AVI for non-tasters.
Population frequency	The PAV taster haplotype has been observed in 49% of Europeans, 58% Asians and 40% African. The AVI allele, non-taster haplotype has been predominantly observed in the European (47%) and Asian population (42%).
Impact of SNPs on protein	The hTAS2R gene contains a single coding exon of 1002 base pairs in length, coding for the TAS2R38 7-transmembrane domain G-Protein Coupled Receptor protein. The taster and non-taster forms of the TAS2R38 bitter receptor differ in their ability to activate the G-protein.
Nutrient interaction	• Bitter chemicals or compounds from exogenous food products. • Bitter chemicals may however also permeate directly into the cell, where the compounds hijack the receptor signaling system, and are responsible for the lingering bitter aftertaste. • The amount of variation in brain activity is striking and the malleability of the brain response is likely to be influenced by belief and experience.
Established diet-gene interactions	• A study conducted in Sardinia demonstrated that the AVI homozygotes were associated with the non-taster phenotype, and heterozygotes and homozygotes of the opposite haplotype PVA were able to taste PTC at low concentrations. There is an additive effect of the haplotype such that people who are heterozygous have lower sensitivities compared with those who are homozygous for the taster form of the receptor, confirming suggestions that homozygotes are especially sensitive to PTC. • Bell and Tepper (2006) investigated sensitivity to the bitterness of PROP in the acceptance and rejection of bitter-tasting vegetables by young children. The non-taster children consumed more vegetables, particularly the vegetables that were bitter tasting, when compared to the taster children during a free-choice intake test. Suggesting that the bitter-taste phenotype contributes to the development of vegetable acceptance and consumption patterns during early childhood.

	• Reed and Knaapila (2010) reviewed several studies, interestingly, in one of them, the non-taster genotype was a significant predictor of alcohol consumption. A second study focused on children and their mothers and demonstrated that children with the non-taster *TAS2R38* genotype had lower sucrose preferences than children with the taster allele.
Dietary recommendations	Knowing whether your client is a super taster or non-taster can be useful in understanding their food choices and preferences. Many bitter super-tasters may find it difficult to consume vegetables, especially cruciferous vegetables. These genotypes should be a marker for you to further investigate your clients' preferences, food choices and tasting experiences. It may require that different and more palatable vegetable choices be made, or the use of other ingredients to minimize the bitter taste.
References	• Bachmanov, A., & Boughter, J. (2012). Genetics of Taste Perception *eLS*. Chichester: John Wiley & Sons. • Bell, K. I., & Tepper, B. J. (2006). Short-term vegetable intake by young children classified by 6-n-propylthoiuracil bitter-taste phenotype. *Am J Clin Nutr, 84*(1), 245-251. • Kim, U.-k., Jorgenson, E., Coon, H., Leppert, M., Risch, N., & Drayna, D. (2003). Positional cloning of the human quantitative trait locus underlying taste sensitivity to phenylthiocarbamide. *Science, 299*(5610), 1221-1225. • Ooi, S.-X., Lee, P.-L., Law, H.-Y., & Say, Y.-H. (2010). Bitter receptor gene (TAS2R38) P49A genotypes and their associations with aversion to vegetables and sweet/fat foods in Malaysian subjects. *Asia Pacific journal of clinical nutrition, 19*(4), 491. • Reed, D. R., & Knaapila, A. (2010). Genetics of taste and smell: poisons and pleasures. *Prog Mol Biol Transl Sci, 94*, 213-240. doi: 10.1016/S1877-1173(10)94008-8 • Tepper, B. J., White, E. A., Koelliker, Y., Lanzara, C., d'Adamo, P., & Gasparini, P. (2009). Genetic Variation in Taste Sensitivity to 6-n-Propylthiouracil and Its Relationship to Taste Perception and Food Selection. *Annals of the New York Academy of Sciences, 1170*(1), 126-139.