leatherhead food research

How do our genes impact our food choices?

The role of genetics in taste perception

Silvia Peleteiro

A Leatherhead Food Research white paper

27

How do our genes impact our food choices?

Variation in taste perceptions can be explained by nature and nurture. In this white paper, Silvia Peleteiro, focuses on the impact genetics play on our taste perceptions, in particular looking at the way we taste fat, and explores how this is impacting our food choices and ultimately our health and wellbeing.

Taste perception varies by individual

In the same way that eyesight varies from person to person, humans also experience 'taste' in different ways. A range of tests can be used to measure the differences in taste perception.

In the sensory world, one common test of taste perception measures individual responsiveness to a bitter compound called 6-n-propylthiouracil, or PROP for short. Individuals are asked to rate their response to bitterness after being given PROP-impregnated discs to taste. Their response classifies them into one of three groups:

- **Super-tasters**: PROP is perceived as an intensely bitter taste and these individuals find it revolting!
- **Medium-tasters**: PROP is perceived as mildly bitter but tasters do not mind it.
- **Non-tasters**: PROP is not perceived at all and these tasters wonder what all the fuss is about!

Super-tasters not only have a higher perception of bitterness, but the general consensus is that they have increased perception to other sensory attributes too, including sourness, saltiness, sweetness, astringency and creaminess[1].

How taste perception shapes our health

Sensory research is now focussing on what these differences in taste perception actually mean for people's diets. How does the way we taste impact our food choice, consumption habits and ultimately our health and wellbeing?

Super-tasters' ability to detect bitter flavours in foods, for example, may lead to their dislike and avoidance of foods with bitter taste qualities, such as green, leafy vegetables, coffee and beer. This in turn could mean that these individuals exclude important compounds from their diet, such as flavonoids, which are found in a range of plants and have important health benefits. On the other hand, super-tasters tend to have a lower risk of heart disease, because they also shy away from very fatty, salty and sugary foods. In contrast,

[1] Pickering, G.J., Jain, A. and Bezawada, R. (2013). Super-tasting gastronomes? Taste phenotype characterization of foodies and wine experts. *Food Quality and Preference*, 28 (1), 85-91.

non-tasters tend to show heightened acceptance for certain high-fat foods[2].

In one study, it is shown that in general, super tasters and medium tasters are more likely to have lower body fat and body mass indices (BMI) and have different serum lipid products than non-tasters[3] (all of which are taken to be positive indicators that an individual is less likely to develop certain chronic diseases). Current research is exploring whether it is the way these different groups perceive the taste of fat which is actually impacting their fat consumption levels and consequently their BMI and their risk of developing certain diseases.

Leatherhead recently carried out a study exploring how different tasters perceived bitterness and creaminess in a range of milk-based products. One finding was that the non-tasters perceived the creaminess of a chocolate milkshake better than the super tasters and liked the milkshake more. This is of particular interest when considering how the perceived creaminess of a product is linked to overall product liking and subsequently calorie intake and BMI.

Changing our taste perception of fat

One obvious area where knowledge about differing fat taste perceptions may have a significant impact is in weight loss.

One hypothesis is that individuals who are obese may be less sensitive to the taste of fat. A recent study[3] assessed the effect of a 6-week low-fat diet (25% of participants' energy intake was from fat) compared with a portion controlled diet (33% of participants' energy intake was from fat). The study was with 53 matched participants classified overweight or obese.

Both diets resulted in participants losing weight and decreasing their fat taste thresholds. There were no changes in the preference for fat foods but the ability to perceive different fat concentrations in foods increased in the group following the low-fat diet.

This research suggests it is possible to increase an individual's fat taste sensitivity by training them through a reduced fat diet. A key application for this would be in training non-tasters (classified through the PROP test) who are obese or overweight to taste fat in the way super-tasters do in order to help them lose weight.

Nature or nurture?

Why do we all perceive taste in different ways? Nature and nurture are both at play in forming an individual's sense of taste. From a nurture point of view, for example, regularly smoking cigarettes will impact an individual's taste sensitivity. Research is now focussing on the extent to which our nature, or our genetics, impacts the way we taste.

Leatherhead realises the importance of genetics in food choice and consumption and has set up a Genetics Taste Panel of 363 Caucasian consumers, who have been

[2] Keller K.L., Steinmann L., Nurse R.J., Tepper B.J. (2002). Genetic taste sensitivity to 6-n-pro- pylthiouracil influences food preference and reported intake in preschool children. *Appetite*, 38(1):3-12.

[3] Newman, L.P., Bolhui, D.P., Torres, S.J., Keast, R.S.J. (2016). Dietary Fat Restriction Increases Fat Taste Sensitivity in People with Obesity. *Obesity*, 24(2):328-334.

genetically profiled for three key genes involved in taste perception. The panel has been segmented into super-tasters, medium-tasters and non-tasters based on their ability to taste the PROP compound. This panel can be used to support confidential client projects understanding the role genetics plays in food choices and preferences or developing more personalised products for consumers.

Which genes affect taste perception?

The difference in bitterness perception which can be measured by the PROP test is due mainly to a variation in the bitter gene called TAS2R38.

Other genes have been found to play a supporting role in PROP-tasters' classification. Among these are the CD36 gene (associated with oral fat perception) and the gustin gene (involved in the growth and the development of taste buds). The Leatherhead Genetics Taste Panel have been profiled for these three genes: TAS2R38, gustin and CD36.

A study conducted by Leatherhead showed that the CD36 gene has a significant impact on food preference and liking.

Genetics enables personalised nutrition

How can we use the knowledge we are developing about genetics and taste? The main goal of any public health strategy is to reduce the risk of obesity, diabetes and cardiovascular problems in the general population – all of which are impacted by food choices. Currently, nutritional recommendations are directed towards a whole population rather than specific target groups. By understanding how our genetics are impacting our taste perception and consequently our food choices, it will be possible to develop a more targeted and personalised approach to nutrition. This in turn presents important and exciting product development and marketing opportunities for manufacturers, brands and retailers alike.

How Leatherhead can help

Leatherhead Food Research has experience testing a wide range of products using the latest consumer and sensory tools with many consumers across the UK. The Genetics Tasting Panel can be used to support confidential projects understanding the role genetics play in food choices or developing more personalized products for consumers

If you would like more information or if you are interested in finding out more, please contact insight@leatherheadfood.com

About the author

Silvia Peleteiro manages the Applied Research team within the Consumer, Sensory and Market Insight department at Leatherhead. Her role includes investigating new methodologies and supporting clients with panel screening, training and validation, coordinating the delivery of standard and tailored training courses and answering client enquiries. Silvia graduated from the University of Madrid, Spain, with a BSc in Nutrition and a BSc in Food Science from the University of California, Davis with a Sensory & Consumer Science Certificate. She joined Leatherhead in 2011.

About Leatherhead Food Research

Leatherhead Food Research provides expertise and support to the global food and drink sector with practical solutions that cover all stages of a product's life cycle from consumer insight, ingredient innovation and sensory testing to food safety consultancy and global regulatory advice. Leatherhead operates a membership programme which represents a who's who of the global food and drinks industry. Supporting all members and clients, large or small, Leatherhead provides consultancy and advice, as well as training, market news, published reports and bespoke projects. Alongside the Member support and project work, our world-renowned experts deliver cutting-edge research in areas that drive long term commercial benefit for the food and drink industry. Leatherhead Food Research is a trading name of Leatherhead Research Ltd, a Science Group Company.

help@leatherheadfood.com T. +44 1372 376761 www.leatherheadfood.com

About Science Group plc

Science Group plc offers independent advisory and leading-edge product development services focused on science and technology initiatives. Its specialist companies, Sagentia, Oakland Innovation, OTM Consulting and Leatherhead Food Research, collaborate closely with their clients in key vertical markets to deliver clear returns on technology and R&D investments. Science Group plc is listed on the London AIM stock exchange and has more than 350 employees, comprised of scientists, nutritionists, engineers, mathematicians and market experts.

Founded in 1986, Science Group was one of the founding companies to form the globally recognised Cambridge, UK high technology and engineering cluster. Today Science Group has two dedicated, UK-based R&D innovation centres in Cambridge and Epsom, and additional offices in London, Boston, Houston and Dubai.

info@sciencegroup.com

www.sciencegroup.com

