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Using functional MRI to understand individual variations in taste perception

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The perception of taste is known to vary widely across individuals. There are many factors that contribute to an individual's taste perception and subsequent food preferences which may in turn impact health status. This presentation will begin with a brief outline of the use of functional MRI (fMRI) to study brain function. This will be followed by an outline of the use of fMRI as a method to explore the brain's cortical activity to taste perception, and improve the understanding of the neural effects of taste phenotype, specifically PROP and thermal taster status (TTS).

The presence of fat alters the taste, aroma and textural attributes of food products and these attributes, together with fat's high energy density, make high fat food products very rewarding to the consumer. The brain's response to iso-viscous, iso-sweet fat emulsions of increasing fat concentration will be presented, and the correlation of behavioural and neuroimaging responses to fat emulsions with PROP taster status will be shown, highlighting the finding of a strong correlation of the fMRI response in somatosensory areas with PROP taster status. A study of how the cortical response of fat emulsions is influenced by prior gastrointestinal exposure to the same emulsion is described to assess effects of satiety and habituation.

Functional magnetic resonance imaging (fMRI) provides a method to reveal the network of brain areas involved in taste perception. Results of using ultra-high-field (7 Tesla) fMRI to investigate how tastes (sweet, bitter, salty, sour, umami, metallic) are mapped in the human primary taste cortex at very high spatial resolution will be show and how this relates to PROP phenotype.

Finally, using fMRI we address the question of whether phantom taste is a central processing phenomenon. We report the results of a study to scan the brains' of thermal tasters whilst their tongue is rapidly cooled or warmed. This unique study demonstrates that the phantom taste sensation modulates the same area of the primary taste cortex as a real taste.

Overall, this presentation aims to advance understanding of human taste perception and individual taste variability using fMRI methods.