Nutrient sensing on the tongue: Effect of calories and sweeteness.

No registrations found.

Ethical review	Positive opinion
Status	Recruiting
Health condition type	-
Study type	Interventional

Summary

ID

NL-OMON23331

Source
NTR

Brief title
Breinproef

Health condition

Calories, artificial sweeteners, carbohydrates, sugars, sweetness, brain activation, reward, nutrient sensing, taste activation.

Calorieën, zoetstoffen, koolhydraten, suikers, zoetheid, hersenactivatie, beloning, nutrient detectie, smaak activatie.

Sponsors and support

Primary sponsor: Wageningen University
Division of Human Nutrition (Bode 62)
PO Box 8129
6700 EV Wageningen
Phone: 0317 – 485302
Source(s) of monetary or material Support: EFRO and fund = initiator = sponsor

Intervention

Outcome measures

Primary outcome

The main outcome of this study is the difference in taste activation in response to exposure to different caloric and non-caloric food stimuli, independent of sweetness (i.e. the difference in voxel activation in the brain).

Secondary outcome

1. The 1st secondary outcome is taste activation in response to caloric and non-caloric stimuli during hunger and during satiety (i.e. the difference in voxel activation in the brain);

2. The 2nd secondary outcome is the correlation between taste activation in response to exposure to caloric and non-caloric stimuli and subject characteristics like reward sensitivity, delayed discounting and impulsivity(i.e. the correlation between voxel activation in the brain and scores from the following questionnaires/tasks: the Kirby monetary choice questionnaire, the Barratt Impulsiveness Scale (BIS-11), the Health and Taste Attitude questionnaire (HTAS), the Behavioral Inhibition System and Behavioral Approach System questionnaire (BIS/BAS), a stroop task and an n-back task.

Study description

Background summary

Rationale:

Humans easily prefer and select carbohydrate rich foods because of their inborn preference for sweet taste. However, recently done studies indicate that a nongustatory factor, caloric content, might also play a role in the formation of preferences for these foods. Nutritive and non-nutritive sweeteners have been shown to differentially affect brain activation during oral exposure. Furthermore, oral exposure to a carbohydrate solution during exercise improved performance, but oral exposure to an artificial sweetener solution did not. Above findings suggest the existence of an oral carbohydrate receptor that responds to carbohydrates rather than to sweetness. However, whether this receptor responds to all carbohydrates or only to specific ones, and whether energy (carbohydrate) sensing takes place in the absence of sweetness is not yet known.

Objective:

The primary objective of this study is to assess whether oral exposure to caloric and non-caloric stimuli elicits discriminable responses in the brain independent of sweetness.

Study design:

The study has a randomized crossover design in which participants taste a fixed amount of six test stimuli, once in fasted and once in a fed state, while their brain responses are measured using functional MRI. Stimuli are subdivided in (i) three sweet caloric food-stimuli (solutions of glucose, fructose and maltodextrin + sucralose), (ii) one non-sweet caloric food-stimulus (solution of maltodextrin), (iii) one sweet non-caloric food-stimulus (solution of sucralose) and (iv) one non-sweet non-caloric food-stimulus that is perceived as neutral (control stimulus: water). The order in which participants are exposed to these stimuli is randomized and counterbalanced.

Study population:

The study population consists of 30 apparently healthy, right-handed, normal weight (BMI 18.5-25 kg/m2), unrestrained women between the age of 18 and 35 y.

Main study parameter/endpoint:

The main study parameter/endpoint is taste activation in response to exposure to different caloric and non-caloric food stimuli.

Study objective

We hypothesize that discriminable responses between oral exposure to caloric and non-caloric stimuli are observed in the following areas: the anterior cingulate cortex, the striatum, the amygdala and areas related to brain reward circuitry (e.g. VTA, substantia nigra and the medial prefrontal cortex). This effect is thought to be seen independent of sweetness (i.e. to exist in the presents and absence of sweet taste).

Study design

1. Taste activation measurements are obtained during two fMRI scans, one during hunger and one during satiety. The scans are minimal 5 days apart;

2. Questionnaires and tasks are filled out before the fMRI scans are made.

Intervention

There are two interventions:

1. Hunger and sated: Participants will undergo one fMRI scan while sated (a meal will be offered to the participant by the researchers) and one fMRI scan while hungry;

2. Exposure to divers types of sugars and sweeteners: During the two scans (hunger and sated) different types of sugars and sweeteners will be offered in a randomized order. The stimuli offered are subdivided in (i) three sweet caloric food-stimuli (solutions of glucose, fructose and maltodextrin + sucralose), (ii) one non-sweet caloric food-stimulus (solution of maltodextrin), (iii) one sweet non-caloric food-stimulus (solution of sucralose) and (iv) one non-sweet non-caloric food-stimulus that is perceived as neutral (control stimulus: water). During one fMRI scan, each of these six stimuli will be offered to the participant 12 times in 2 ml sips by a gustometer.

Contacts

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Eligibility criteria

Inclusion criteria

1. Age: 18-35 years;

2. Being female;

3. BMI: 18.5 – 25.0 kg/m2;

4. Healthy (as judged by the participant);

5. Being right handed;

6. Willing to comply with the study procedures;

7. Willing to be informed about incidental findings of pathology;

8. Having given written informed consent;

9. Successful completion of the training session.

Exclusion criteria

1. Restraint eating (women: score > 2.80);

2. Lack of appetite;

3. Having difficulties with swallowing/eating;

4. Usage of an energy restricted diet during the last two months;

5. Weight loss or weight gain of 5 kg or more during the last two months;

6. Stomach or bowel diseases;

7. Diabetes, thyroid disease, other endocrine disorders;

8. Having a history of neurological disorders;

9. Having taste or smell disorders;

10. Usage of daily medication other than oral contraceptives or Paracetamol;

11. Being pregnant or lactating;

12. Smoking more than one cigarette/cigar a day;

13. Being allergic/intolerant for products under study;

14. Exclusive consumption of ‘light’ versions of products;

15. Avoidance of ‘light’ versions of products;

16. Working at the Division of Human Nutrition (WUR);

17. Current participation in other research from the Division of Human Nutrition (WUR);

18. Having a history of or current alcohol consumption > 28 units per week;

19. Having a contra-indication to MRI scanning (including, but not limited to):

A. Claustrophobia;

B. Epilepsy or a family history of epilepsy;

C. Pacemakers and defibrillators;

D. Intraorbital or intraocular metallic fragments;

E. Ferromagnetic implants;

F. Presence of non-removable metal objects in the mouth.

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Allocation:	Randomized controlled trial
Masking:	Open (masking not used)
Control:	N/A , unknown

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	13-11-2012
Enrollment:	30
Type:	Anticipated

Ethics review

Positive opinion

Date:	13-12-2012
Application type:	First submission

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
NTR-new	NL3598
NTR-old	NTR3749
Other	METC University Wageningen / CCMO : 12/24 / NL41579.081.12
ISRCTN	ISRCTN wordt niet meer aangevraagd.

Study results

Summary results
N/A