Investigating the link between taste perception and circulating levels of of insulin (and related metabolic hormones): a pilot study.

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We propose that there will be a link between taste sensitivity and overall metabolic function. We hypothesize that non-tasters, medium-tasters and super-tasters will have different levels of metabolic hormones in their general circulation. Our study...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Glucose metabolism disorders (incl diabetes mellitus)
Study type	Observational invasive

Summary

ID

NL-OMON36154

Source
ToetsingOnline

Brief title
TPMH (Taste Perception and Metabolic Hormones)

Condition

- Glucose metabolism disorders (incl diabetes mellitus)
- Appetite and general nutritional disorders

Synonym
taste and hormonal regulation, Taste-induced regulation of metabolic hormones

Research involving
Human

Sponsors and support

Primary sponsor: Onze Lieve Vrouwe Gasthuis
Source(s) of monetary or material Support: Better Immune System;OLVG and National Institute Aging. Het betreft hier financiering uit eigen middelen

Intervention

Keyword: diabetes, metabolic hormones, obesity, taste perception

Outcome measures

Primary outcome

- Fasting plasma and saliva levels of circulating hormones (Ghrelin, Leptin,

Insulin, GIP, GLP-1, PP, PYY, BDNF, NPY, Adiponectin)

- Picture of the tongue to count the number of taste buds per cm2

- Taste perception assessment with PTC strips

- A copy of the handpalm and fingers of the right hand, which will enable the

analysis of the potential influence of prenatal hormones by calculating the

ratio between the index and the ring finger

Secondary outcome

na

Study description

Background summary

Olfaction and gustation are important sensory modalities for locating food and for determining which foods to ingest, as they indicate the quality, safety, and palatibility of the food. Taste sensations arise from stimulation of the gustatory receptors located within the oropharyngeal mucosa. Taste begins with molecular signaling events involving receptors at the surface membranes of modified epithelial cells, which share many characteristics with neurons. The taste cells in the tongue are located in specialized structures, known as taste buds. Groups of taste buds are organized in papillae and each papilla contains

approximatley 3 to 5 taste buds. It is becoming apparent that there is a strong link between taste perception and metabolic control. In fact, it seems that endocrine signaling in the taste buds of the tongue is likely to influence food intake, satiety and the general metabolic state. For example, several hormones that are crucial for the control of energy balance and appetite control have now been found to be present in taste buds and are thought to exert a strong local effect on taste sensitivity. These hormones include: glucagon-like peptide 1 (GLP-1), vasoactive intestinal peptide (VIP), ghrelin, glucagon, cholecystokinin, and neuropeptide Y (NPY).

The presence and functionality of metabolic hormones in the tongue suggests that the proper maintenance of olfactory and gustatory sensations is critical for managing adequate energy intake. Reinforcing this proposition, it has recently been demonstrated that alterations in flavor perception are indeed linked to metabolic dysfunction. Appetite hormones and their receptors in the tongue are likely to control taste sensitivity, which may then subsequently alter food preferences and food intake. For example, leptin, an anorexigenic hormone, is produced by adipocytes and plays a role in controlling food intake by acting upon leptin receptors expressed in the hypothalamus. Recent findings however have demonstrated that leptin receptor is also expressed on taste buds and that peripherally circulating leptin can activate these receptors to significantly attenuate sweet taste sensitivity.

It is clear from our research that numerous appetite hormones are present within the tongue and that there is a highly complex and organized interplay between peripheral hormones and tongue hormones. The interplay between these systems modulates not only gustatory function but also whole-body physiological functions, such as metabolic control and energy homeostasis. Many of the exact functional roles of these hormones remain to be established because we have only reached the tip of the iceberg with regards to elucidating how these hormones also modulate gustation. From the functional roles that have been established so far, it is becoming apparent that many hormones retain similar functional mechanistic actions at different target organs. The prime example so far is GLP-1, which modulates multiple coordinated energy-regulating programs, i.e. circulatory glycemic control in the periphery and sweet taste perception in the tongue. There seems to be a conservation of function through multiple layers of physiological systems, which from an evolutionary standpoint would create a more synergistic and efficient homeostatic and sensorial system. By gaining a better understanding of how these endocrine functions are conserved throughout different physiological modalities, we will obtain a better appreciation of how complex higher-order endocrine systems are organized. A greater understanding of the functional structure of these systems will facilitate a more efficient pharmacological exploitation of them, to combat conditions such as obesity and Type 2 diabetes. So far, research in this area is in its infancy and we hope that the next few years will see an exponential improvement in our knowledge of hormonal activity in the tongue. Currently, it is not clear how, in humans, taste sensitivity could be linked to peripheral metabolic function. Clinical studies are needed to establish whether non-, medium-, and super-taster ability is linked to peripheral

metabolic control. A greater understanding of the link between taste sensitivity and metabolic function could lead to novel tongue-targeted therapeutics for the treatment of obesity, metabolic syndrome, and Type 2 diabetes.

Study objective

We propose that there will be a link between taste sensitivity and overall metabolic function. We hypothesize that non-tasters, medium-tasters and super-tasters will have different levels of metabolic hormones in their general circulation. Our study will contain two arms: one which contains healthy subjects that fall into one of the three taste sensitivity groups (non-tasters and tasters) and a second which will contain subjects presenting with Type 2 diabetes, a condition that may involve circulatory alterations in taste-modifying energy-regulatory hormones.

Study design

This study will take 6 months and we will adhere to the following time-line:
Step 1. Recruitment of subjects (month 1)
10 subjects currently being treated by the Onze Lieve Vrouwe Gasthuis for Type 2 diabetes will be recruited by their physician. Additionally, healthy control subjects that are non-tasters (n = 15) and tasters (n = 15) will be recruited by the Better Immune System Foundation.
Step 2. Data and blood/saliva collection (month 1-2)
Physicians at the Onze Lieve Vrouwe Gasthuis will take measurements form the participating study subjects and the following parameters will be collected: interview/questionnaire, physical measurements (body weight), taste tests, tongue images, and collection of plasma and saliva samples.
Step 3. Saliva and plasma analysis (month 3-4)
The levels of the metabolic hormones in plasma and saliva will be analyzed by the National Institute on Aging.
Step 4. Perception and behavior analysis (month 3-4)
Perception of taste and olfaction will be evaluated by the Better Immune System Foundation and will be correlated to eating habits and general behavior.
Step 5. Joint analysis and conclusions (month 5-6)
The National Institute on Aging, Onze Lieve Vrouwe Gasthuis, and the Better Immune System Foundation will analyze the combined data and publish the findings.

Study burden and risks

There are no known risks for these procedures. The taste and smell strips could potentially be perceived as unpleasant by some subjects. The blood collection could potentially have these following effects: feelings of weakness, mild pain, irritation around the injection area, and a low chance of infection. The

total procedure takes approximately 15 minutes

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

Healthy subjects: male, caucasian, age 30-55, Body Mass Index between 18.5 and 24.9, that are tasters (n=15) and non-tasters (n = 15)
male diabetic subjects type 2 age 30-55, bmi> 18.5 (n=10)

Exclusion criteria

Healthy subjects : Age below 30 years or over 55 years, Body mass index lower than 18.5

kg/m2 or higher than 24.9 kg/m2, Psychiatric morbidity (eating disorder, depression, alcoholism), Co-morbidity, (cardiovascular disease, thyroid disease, diabetes), Previous history of cancer, Use of regular anti-inflammatory medication, Consumption of diets or supplements high in phytoestrogens, Smoking
Diabetics: use of GLP-1 agonists; BMI < 18,5, other exclusion criteria as healthy subjects

Study design

Design

Study type:	Observational invasive
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Basic science

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	22-11-2011
Enrollment:	40
Type:	Actual

Ethics review

Approved WMO

Date:	19-05-2011
Application type:	First submission
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)

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
CCMO	NL35460.100.11