The Effect of Fasting on the Interaction between Taste Perception and Metabolic Regulation

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ABSTRACT

Taste perception, via reception of tastants and endocrine signalling within the tongue, plays a key role in consumer acceptance and sensory evaluation of foods. Taste perception triggers hormones that are crucial in the control energy balance and appetite exerts a strong effect on food intake, satiety and metabolic regulation. Due to the complex interaction of genetic, biological and psychological factors, the influence of fasting on the relationship between taste perception and associated metabolic parameters remains to be explored.

The present study investigated the effect of fasting on interaction between taste perception and metabolic regulation through three main objectives. The first objective was to explore the relationship between the bitter taste sensitivity and the fatty acid taste sensitivity. Forty healthy male adults were classified into three taster groups based on their sensitivity to bitter agent 6-N-2-propylthiouracil (PROP): nontasters (n=10), medium tasters (n=20) and supertasters (n=10). The groups were also confirmed with fungiform papillae densities. However, no significant correlation was observed between PROP status and fungiform papillae densities. Also, results showed neither PROP status nor the fungiform papillae density associated with fatty acid thresholds.

The second objective was to investigate the effect of overnight fasting or meal consumption on sweet and fatty acid taste perception. Detection thresholds for sucrose and linoleic acid were measured by using ASTM method during fasted and satiated state. The result showed increases in sucrose detection thresholds under the both fasted state and satiated state. The linoleic acid thresholds increased after meal consumption and reduced after prolonged fasting.

This led to a further investigation on the last objective- the role of key plasma metabolites on fatty acid taste perception in fasting and satiated states. The results indicated that neither the effect of metabolic status on fatty acids thresholds nor relationships between fatty acid thresholds and blood metabolic parameters were observed. Furthermore, there was no significant difference in blood metabolites across
PROP taster group, which means that PROP classification cannot be considered as a predictor to the blood metabolites.

In conclusion, the present study provides evidence suggesting that PROP sensitivity cannot predict fatty acid taste sensitivity and metabolic status has no effect on fat taste perception. In addition, blood metabolites do not show any difference among PROP taster group and any relationship with taste perception either.
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# TABLE OF CONTENTS

ABSTRACT ....................................................................................................................... I
ACKNOWLEDGEMENTS ................................................................................................. III
TABLE OF CONTENTS ............................................................................................... IV
LIST OF FIGURES ....................................................................................................... VII
LIST OF TABLES .......................................................................................................... IX
LIST OF ABBREVIATIONS ......................................................................................... X

1 Introduction ............................................................................................................. 1

2 Literature review .................................................................................................... 3

2.1 Fat perception ....................................................................................................... 3

2.1.1 Dietary fat ...................................................................................................... 3

2.1.2 How is fat detected? ........................................................................................ 5

2.2 Methods for testing taste threshold .................................................................... 10

2.3 Stopping rules of ASTM method ......................................................................... 12

2.4 PROP taste status and classification methods ....................................................... 15

2.4.1 Methods for PROP classification ................................................................... 15

2.4.2 The influence of PROP status on food preference and creaminess ............... 17

2.5 Body phenotype and blood metabolites .............................................................. 19

2.5.1 The relations between taste perception and BMI ........................................... 19

2.5.2 Taste perception and hormones ..................................................................... 20

2.5.3 The relationship between oral stimulation and blood metabolites ............... 21

2.5.4 The effect of metabolic status on blood metabolites ..................................... 22

2.5.5 The influence of diet composition on metabolic responses ......................... 23

2.6 Conclusions .......................................................................................................... 26

3 Materials and Methods .......................................................................................... 28

3.1 Study outline ........................................................................................................ 28

3.2 Subjects ................................................................................................................ 30
3.3 Linoleic acid (LA) sample
3.4 Chemical analysis
  3.4.1 Emulsion preparation and homogenization techniques
  3.4.2 Emulsion particle size and physicochemical stability
  3.4.3 Viscosity and fatty acid oxidation
  3.4.4 PROP taster status
  3.4.5 LA and sucrose detection thresholds
3.5 Breakfast consumption during the test
3.6 Fungiform papillae counts
3.7 Data analysis
  3.7.1 PROP classification
  3.7.2 Fungiform Papillae counts
  3.7.3 Body phenotypes
  3.7.4 Main trials
4 Results and Discussion
  4.1 Chemical analysis
    4.1.1 Emulsion stabilization and micrograph observation
    4.1.2 Particle size distribution
    4.1.3 Apparent viscosity analysis
    4.1.4 Fatty acid oxidation (GC analysis)
  4.2 Preliminary test
    4.2.1 PROP status classification
    4.2.2 The relationship between PROP status and FP densities
    4.2.3 Body phenotype and PROP status
  4.3 Sensory tests and metabolic analysis
    4.3.1 Comparison and correlation in sensory thresholds
    4.3.2 Comparison and correlation in sensory thresholds
5  Conclusion and Recommendation ................................................................. 65
6  References .................................................................................................. 66
7  Appendix ................................................................................................... 76
1  A Labelled Magnitude Scale ...................................................................... 76
LIST OF FIGURES

Figure 1 Chemical structure of glycerol and saturated triglycerides ................................3
Figure 2 Chemical structures of fatty acids ......................................................................4
Figure 3 Overview of the study involving 3 visits ............................................................29
Figure 4 Detailed diagrams showing trials .....................................................................29
Figure 5 Appearance of emulsions .................................................................................38
Figure 6 Micrographs of emulsions produced by different emulsifying processor
before overnight stand ..................................................................................................40
Figure 7 Viscosity profile of emulsions with varying LA concentrations ......................43
Figure 8 Results of GC analysis ...................................................................................434
Figure 9 Intensity ratings of NaCl and PROP for a typical non taster and a supertaster
........................................................................................................................................45
Figure 10 Intensity ratings of NaCl and PROP for unclassified subjects for a typical
nontaster and a typical supertaster ..................................................................................436
Figure 11 Scatter plot of PROP ratio vs level 2 PROP intensity ratings for 40 male
subjects ............................................................................................................................47
Figure 12 Interaction graphs of taster group × stimuli type for 3 concentration levels
........................................................................................................................................438
Figure 13 NaCl and PROP taste intensity ratings for nontasters, medium tasters, and
supertasters .....................................................................................................................48
Figure 14 Fungiform papillae on human tongues ................................................... 50

Figure 15 The density of fungiform papillae of each taster group ......................... 50

Figure 16 Mean BMI of each taster group ............................................................. 503
LIST OF TABLES

Table 1 Fatty acid composition (w %) of some common edible fats and oils ..............5

Table 2 Compositions and emulsifying Processers of each obtained sample ..........34

Table 3 Concentrations used for the determination of detection thresholds ..........34

Table 4 Nutrition information of the breakfast ................................................34

Table 5 Average particle size of each sample .................................................41

Table 6 Spearman correlation coefficient values ($r^2$-value) and their significances between fungiform papillae densities and taste thresholds ........................................52

Table 7 Subject characteristics ......................................................................52

Table 8 Pearson’s correlations coefficient values ($r$-value) and their significances between body phenotype parameters .........................................................52

Table 9 Average detection thresholds for sucrose and linoleic acid of each PROP taster group and comparison of threshold values between/within taster groups during fasted and satiated states .........................................................55

Table 10 Mean concentrations of plasma metabolite parameters (glucose, TC,TG, HDL-TC and NEFA) for each PROP taster group and comparison between/within taster groups during fasted and satiated states .........................................................61
LIST OF ABBREVIATIONS

3-AFC  3-alternative forced choice
ANOVA Repeated-measure analysis of variance
APC Aerobic plate count
ASTM American Society for Testing and Materials
B trial Breakfast being provided trial
B1 The session before breakfast in B trial
B2 The session after breakfast in B trial
BMI Body mass index
CCK Cholecystokinin
CD36 Cluster of differentiation 36
CGRP Calcitonin-gene related peptide
DRK Delayed rectifying potassium channels
EDTA Ethylenediaminetetraacetic acid
FPG Fasting plasma glucose
GC Gas chromatography
GLP-1 Glucagon-like peptide-1
GPCR G protein-coupled receptors
HDL-C High density lipoprotein cholesterol
LA Linoleic acid
LMS Labeled magnitude scale
MT Medium- taster
NB trial No breakfast trial
NB1 the session before break in NB trial
NB2 the session after break in NB trial
NEFA Non-esterified fatty acid
NT Non-taster
PPG Postprandial plasma glucose
PROP 6-N-2- propylthiouracil
PTC Phenylthiocarbamide
PYY Peptide YY
SEM Standard error of mean
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ST</td>
<td>Super-taster</td>
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<tr>
<td>TC</td>
<td>Total Cholesterol</td>
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<td>TG</td>
<td>Triglyceride</td>
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