

INVESTIGATING SATIETY FOR HEALTHY WEIGHT



TNO innovation
for life

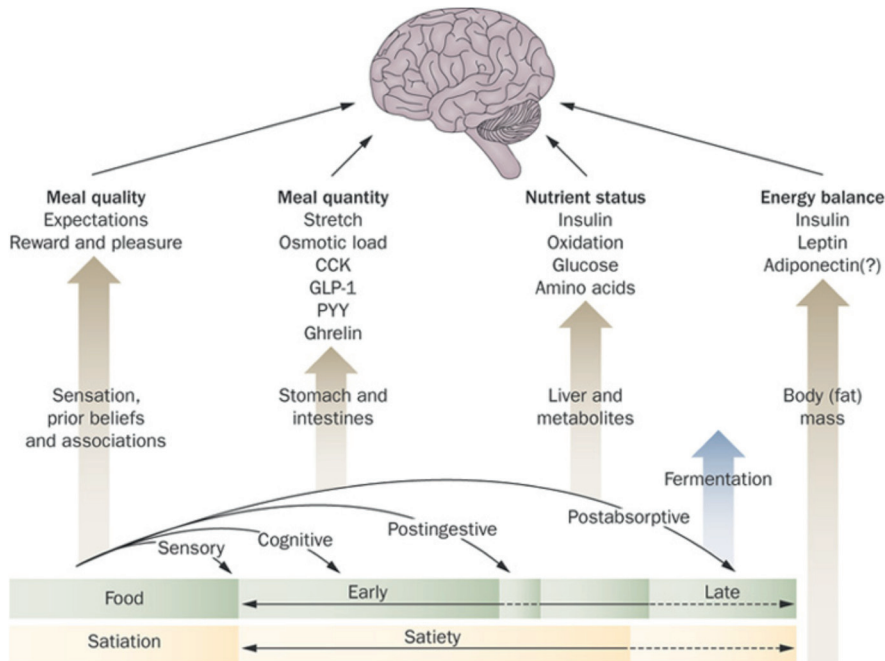
APPETITE CONTROL

Modulating feelings of hunger and satiety could be a promising approach in weight management. TNO Food & Nutrition offers advanced assessment tools to support the development of food products that help address issues of overweight and underweight. This can reduce time, cost, and time-to-market.

Increasing numbers of food manufacturers are looking at appetite control as an approach for product development. In western countries the number of overweight people is on the rise while, at the same time, ageing of the population is resulting in increasing numbers of fragile, underweight elderly. Food products that modulate feelings of hunger and satiety could be a promising tool in addressing these issues. However, the complex processes involved in appetite control are not yet fully understood, making it challenging for food manufacturers to select the most-promising bioactive ingredients and to develop products with well-substantiated health claims.

TAILOR-MADE ADVICE

TNO has developed a range of advanced assessment tools that help to reveal the mechanisms involved in hunger and satiety. Our services range from the assessment of current and new biomarkers for satiety (induction) and the screening of bioactive ingredients, to performing human intervention studies, concept development and optimization. Our multidisciplinary, integrated approach allows us to provide tailor-made advice.



Appetite Control: methodological aspects of the evaluation of foods (ILSI) Obesity Reviews (2010) 11, 251-270, J. Blundell e.a.

SERVICES

Analysis of satiation and satiety biomarkers

- Cost-effective analysis platform. Wide-ranging, reliable, fast.
- Additional benefits of TNO's unique TIM Gastrointestinal models.

Analysis platform for endocannabinoids and N-Acyl-serotonins

- Globally unique leading-edge analytics
- Interpretation and translation of results for these important regulators of metabolism.

In vitro and in silico models of satiety inducement (small intestine)

- Human cell lines for ingredient screening
- Intestinal ex vivo segments from pigs
- Knowledgeable use of statistical models, integration of results

Human intervention studies

- Strong track record in clinical trials (Inc. satiety & satiation)
- Also addressing wellbeing and consumer behaviour

Analysis of new targets for satiety

- New biomarkers discovery

New food concepts for appetite control and weight management

- Creative, thinking out-of-the-box, new insights, innovative food technologies

APPETITE INVESTIGATED

TNO has been involved in several groundbreaking projects on hunger and satiety. A few years ago it was demonstrated that a breakfast containing complex carbohydrates is more satiating and decreases feelings of 'fatigue' compared to a breakfast based on simple carbohydrates

- (1). In another study, the mechanism behind the satiating power of proteins was investigated. (2). TNO has performed pioneering research on the role of endocannabinoids in hunger and satiety (3, 4, 5).

REGULATORY ASPECTS

European food legislation is constantly changing: legal compliance on issues such as food labelling, health claims, novel foods, food additives, food packaging, nanomaterials and GMO is fundamental to the successful launching of new food products onto the European market. TNO ensures products, labelling and marketing statements comply with current legislation.

BUSINESS MODELS

TNO employs several business models that facilitate collaboration:

- Consultation on ingredient screening and product development
- Contract research
- Co-development research

REFERENCES

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3. Development and validation of a quantitative method for the determination of 12 endo-cannabinoids and related compounds in human plasma using liquid chromatography-tandem mass spectrometry. Balvers, Verhoeckx and Witkamp. *J Chromatogr B Analyt Technol Bio-med Life Sci* (2009) May 15 ;877(14-15):1583-90. Epub 2009 Apr 8.
4. Docosahexaenoic acid and eicosapentaenoic acid are converted by 3T3-L1 adipocytes to N-acyl ethanolamines with anti-inflammatory properties. Balvers, Verhoeckx, Plastina, Wor-telboer, Meijerink and Witkamp; *Biochim Biophys Acta* (2010 Oct; 1801(10):1107-14. Epub 2010 Jun 27.
5. Plasma anandamide and other N-acyl ethanolamines are correlated with their corresponding free fatty acid levels under both fasting and non-fasting conditions in women. Joosten, Balvers, Verhoeckx, Hendriks and Witkamp. *Nutr Metab* (2010) Jun 14;7:49.

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