Oro-sensory signals for satiation: effects of food properties

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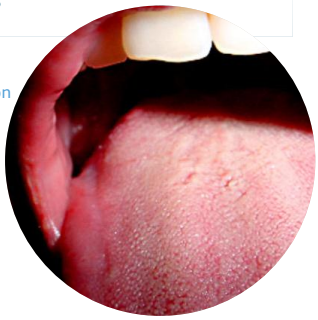

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Oro-sensory signals for satiation: effects of food properties

31 October, 2013
Dr. Monica Mars

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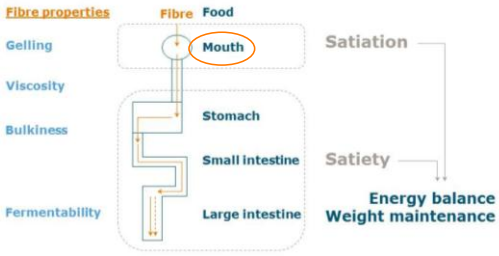
Symposium Fibres in Food and Feed: biological mechanisms of food intake

Approach



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The mouth

"Gate-keeper"

- Safety of the food
- Bolus formation
- Temperature

"Wake-up call for the body"

- Senses the nutrient content and satiating value of the food.
- So called **"cephalic phase responses"** are elicited.

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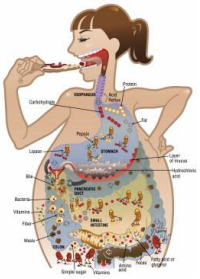
Cephalic phase responses

- Anticipatory physiological responses
- Occur before swallowing
- Aimed at optimal digestion and absorption of nutrients
- E.g. salivation, insulin secretion, stomach emptying, gastro-intestinal motility, ...



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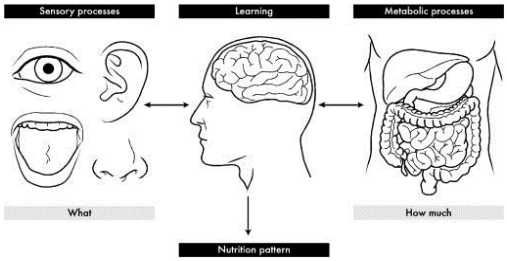
Meaning of sensory signals is learned



De Graaf, 2012

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What is oro-sensory exposure?

"Exposure of the oral cavity to sensory cues"

- Tastants and odours
- Perception of texture through different senses

- Intensity and duration of cues
- Changes in cues during processing of food

(e.g. particle size, breakdown of food, lubrication)

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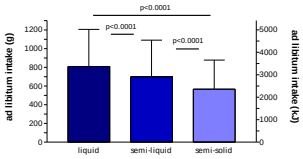
Effects of viscosity on satiation



- Chocolate custard/milk
- 108 healthy subjects
- Standardized satiety state
- 3 times new portion of 1.5 liter 90 minute movie
- Subjects were not aware of the exact study aim

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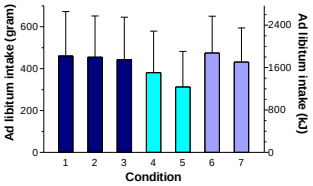
Zijlstra et al. Int J Obes. 2008

Effect of bite size and oral processing on satiation

22 healthy subjects
Product = semi-solid



Cond.	Bite size	Oral proc. time
1	Free	Free
2	Free	3 sec
3	Free	9 sec
4	5 g	3 sec
5	5 g	9 sec
6	15 g	3 sec
7	15 g	9 sec

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(Zijlstra et al., 2009)

Effect of salt intensity and oral exposure and satiation

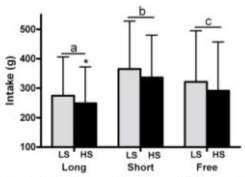
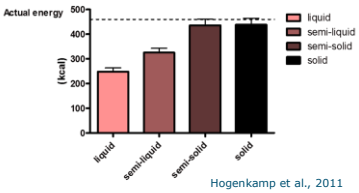


FIGURE 2 Men's ad libitum intake of LS and HS soups in the long, short, and free exposure conditions. Values are mean + SD, $n = 55$. Pairs of means without a common letter differ, $P < 0.05$. *Different from corresponding LS, $P < 0.05$. LS, low salt; HS, high salt.

Bolhuis et al., 2011

Effect of texture on expected satiety



Hogenkamp et al., 2011

Why are fibres interesting?

- In general fibre rich products need more processing before they can be swallowed
- Change of texture before and during mastication and lubrication
  - viscosity
  - gelling
- Provide low calorie bulk
- To a certain extent these effects can be manipulated and controlled

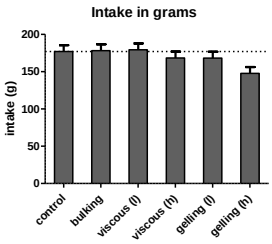
Effect of adding fibres to cookies

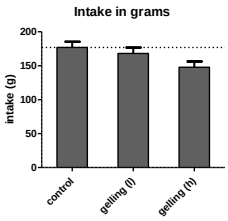
6 types of cookies

- Control
  Flower replaced by:
- Bulking (cellulose 5g/100g)
- Viscosity low (guar gum 1.25g/100g)
- Viscosity high (guar gum 2.5g/100g)
- Gelling low (alginate 2.5g/100g)
- Gelling high (alginate 5g/100g)

Wanders et al., 2012

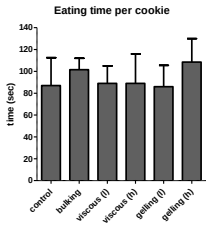
Effect of adding fibres to cookies

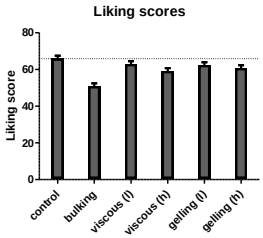




Wanders et al., 2012

Effect of adding fibres to cookies





Wanders et al., 2012

Adding pectin to milkshake

Satiety questionnaire

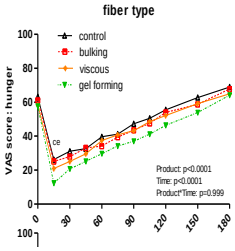
Questionnaire 1

How hungry are you at the moment?

Not hungry at all — Extremely hungry

How full do you feel at the moment?

Not full at all — Extremely full



Wanders et al., submitted

Conclusion

- Oro-sensory signals are important in forming (unconscious) expectations of the nutrient content and satiating value of foods
- Fibers are potentially interesting ingredients to manipulate texture and hence sensory perception of foods
- Maintaining palatability is essential
- However, little research has been done on effects of repeated consumption and the (physiological) adaptations.

Thank you for listening!

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