CARREFOURS
DE L'INNOVATION AGRONOMIQUE

Mécanismes en bouche et variabilité inter-individuelle. Liens entre paramètres physiologiques, libération des stimuli sensoriels et perception de l'aliment.

Gilles FERON & Elisabeth GUICHARD

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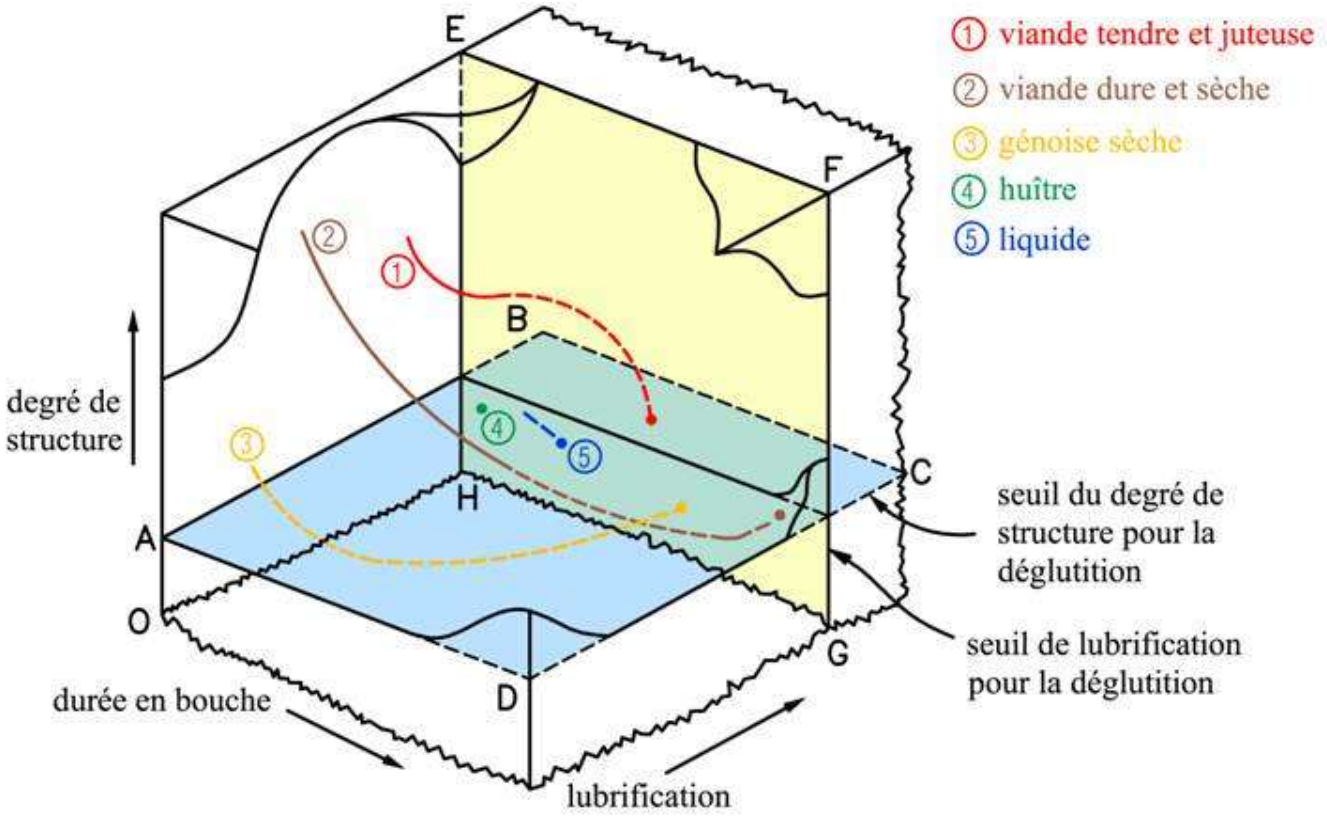
The Food Oral Processing (FOP)

Courtesy of Flix Productions Medical Animation http://www.medflix.com

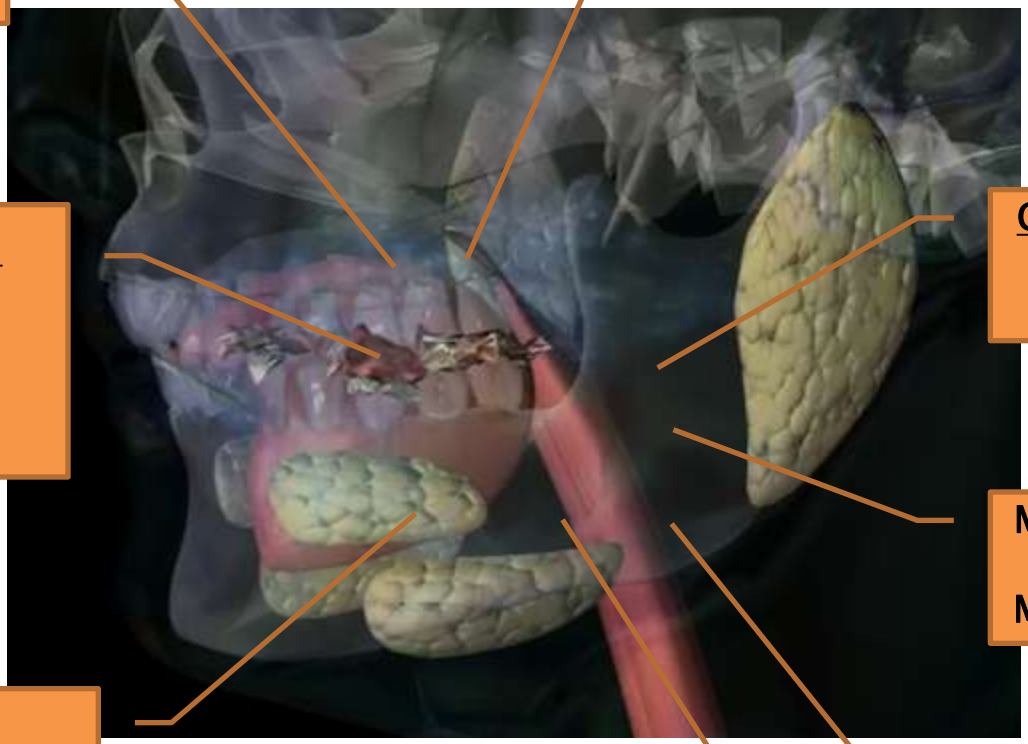
Food Bolus Trajectory



D'après Hutchings et Lillford (1988)

Aroma & taste release & perception

Oral volume
Oral health status



Bolus properties:
Moistening
Spreadability
Viscosity
Particle size

Chewing parameters:
Wtot, amplitude, duration

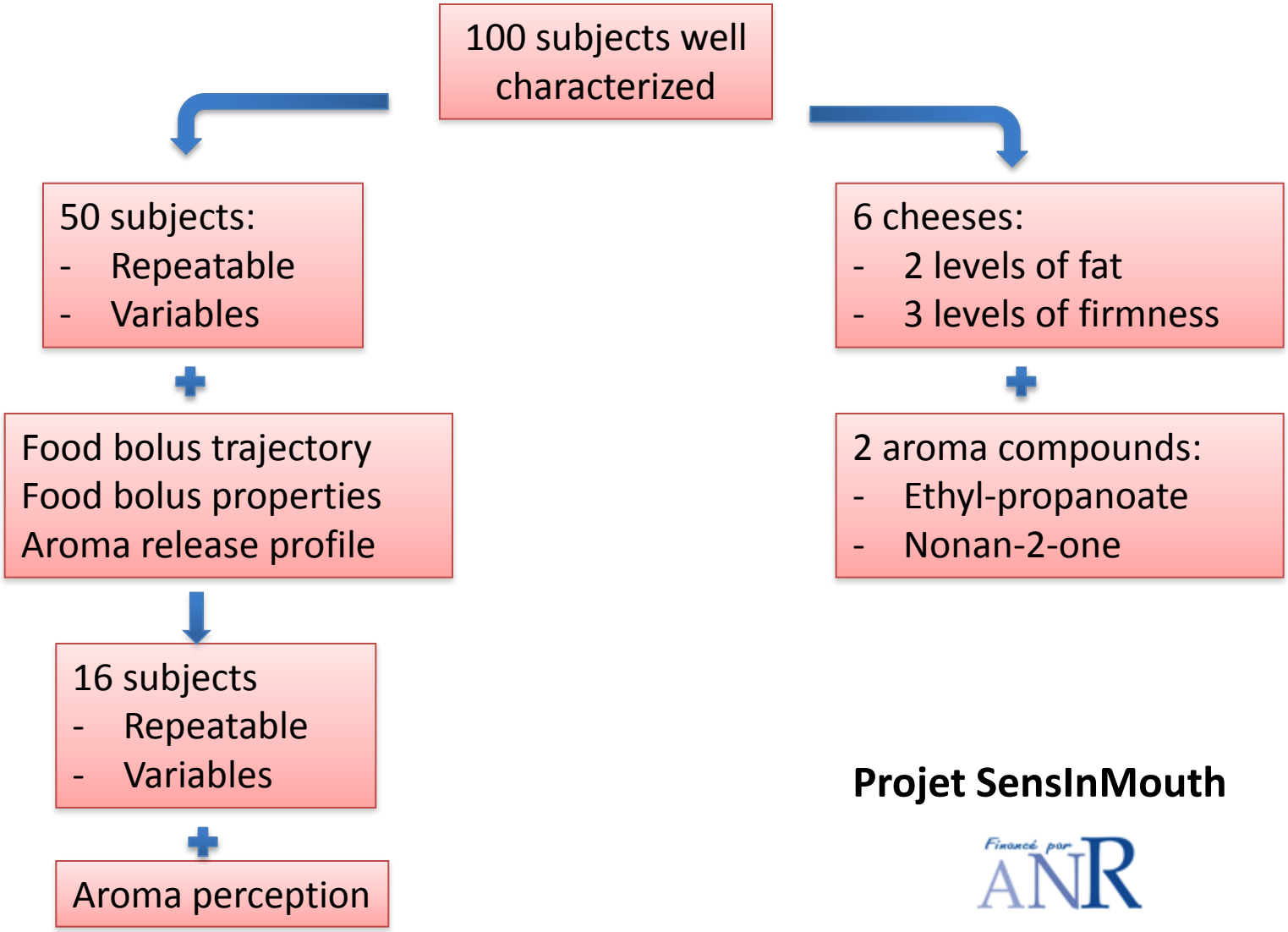
Masticatory efficiency

Masticatory normality

Salivary flow
Stimulated & at rest

Respiratory flow

Saliva properties & composition



Projet SensInMouth

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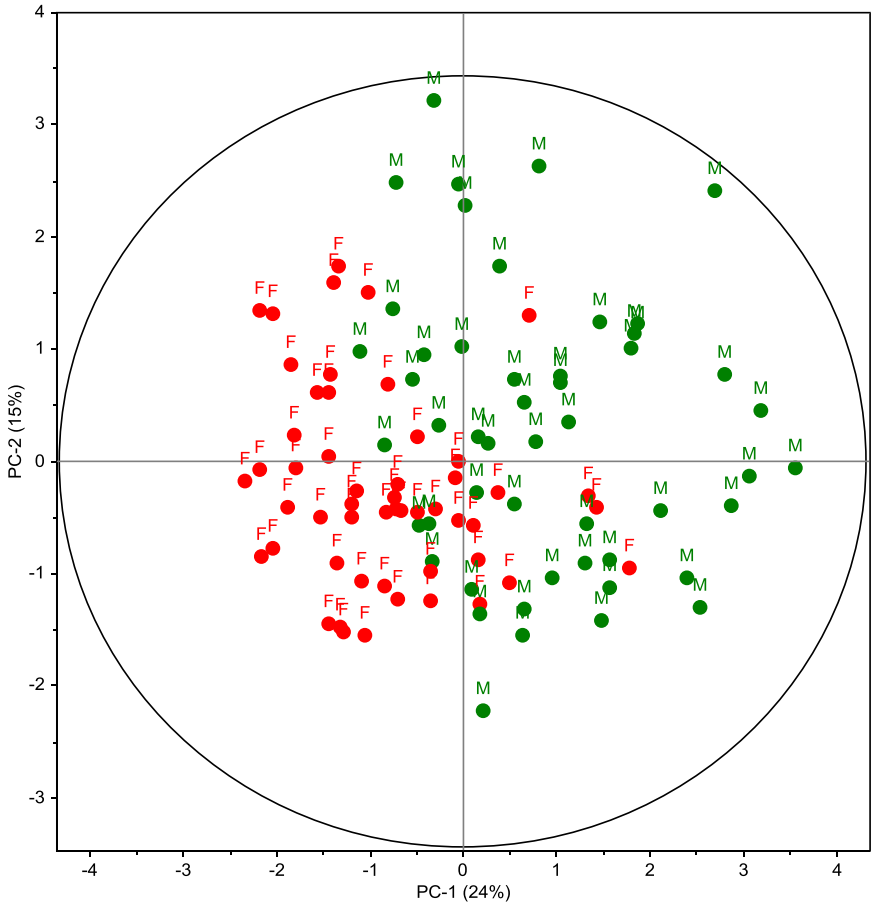
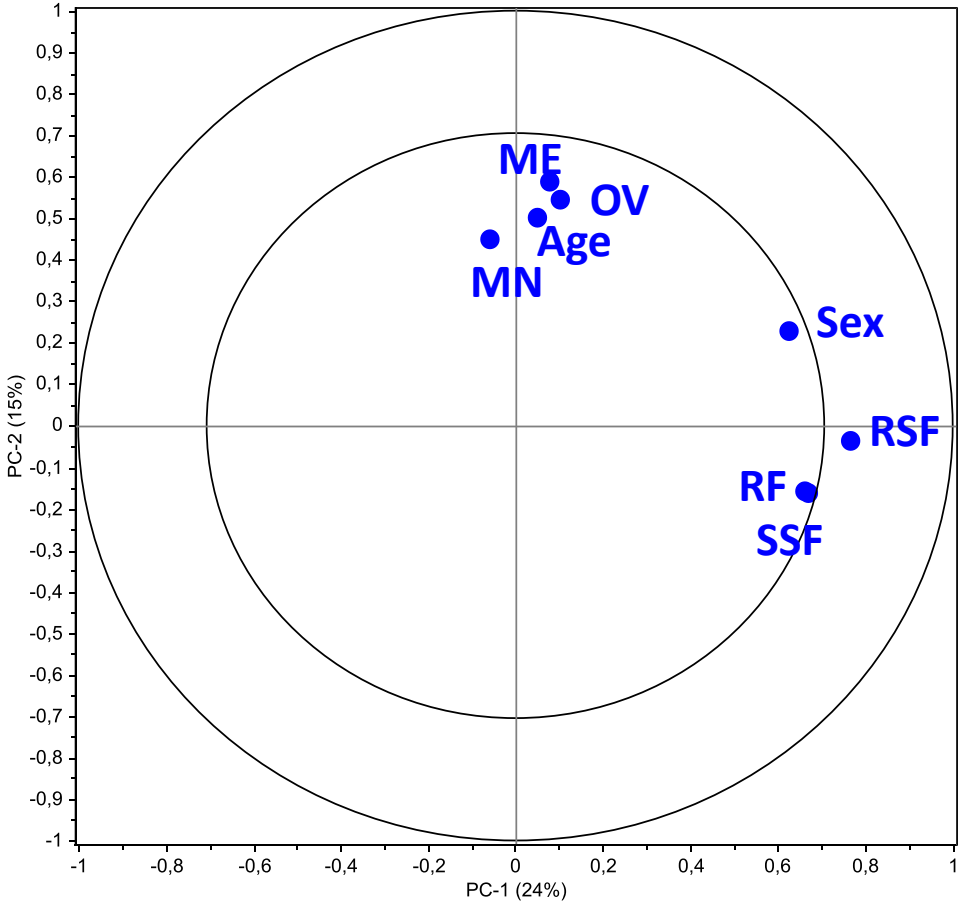
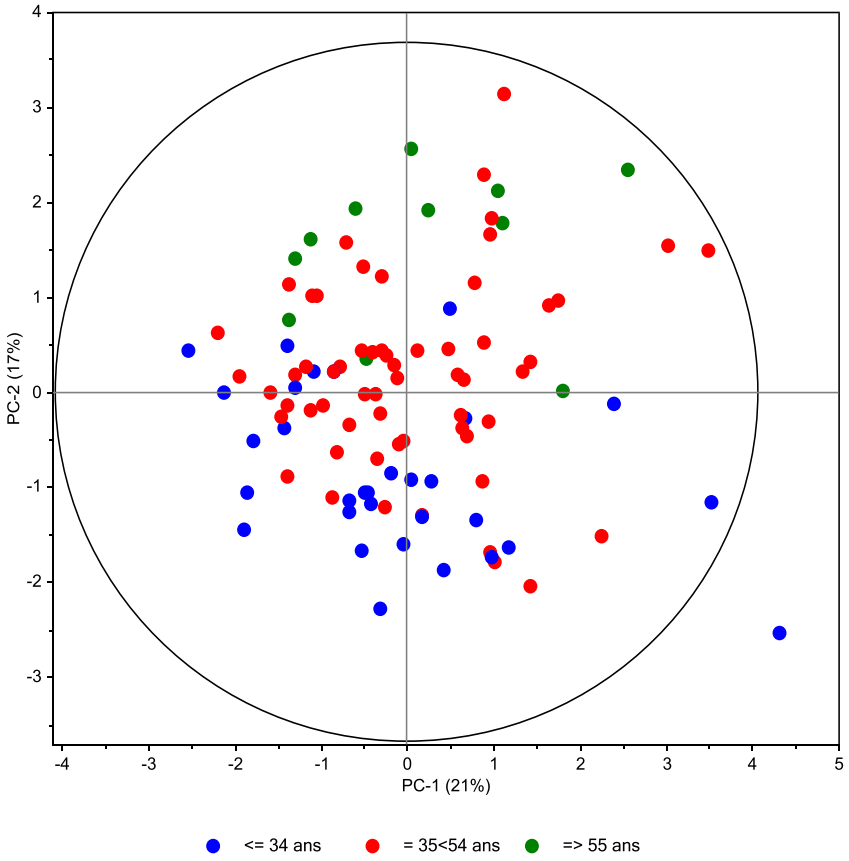
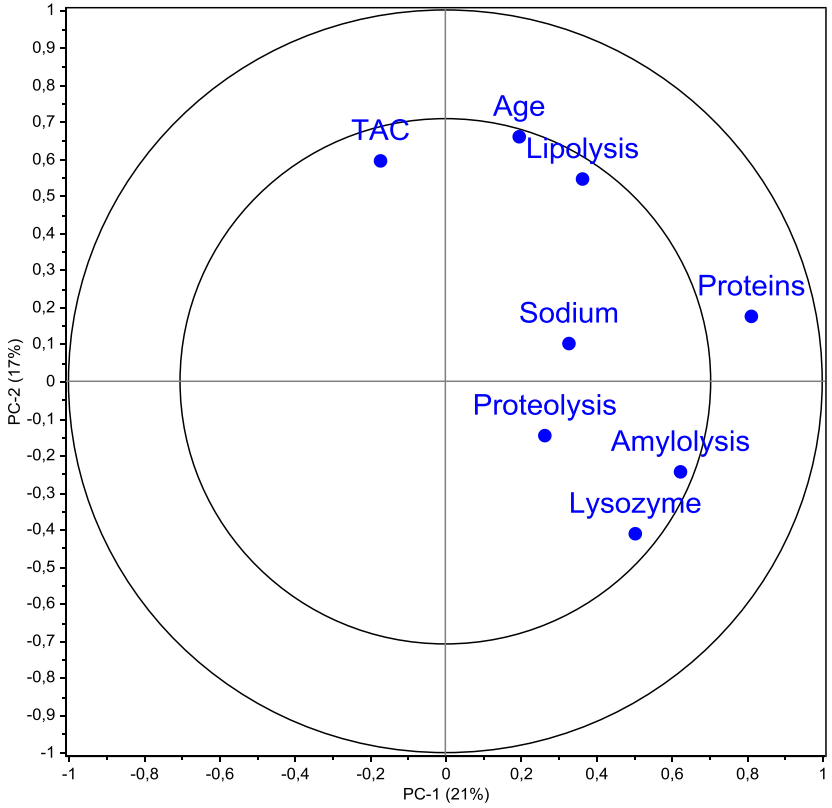
Masticatory & salivary parameters – 100 subjects



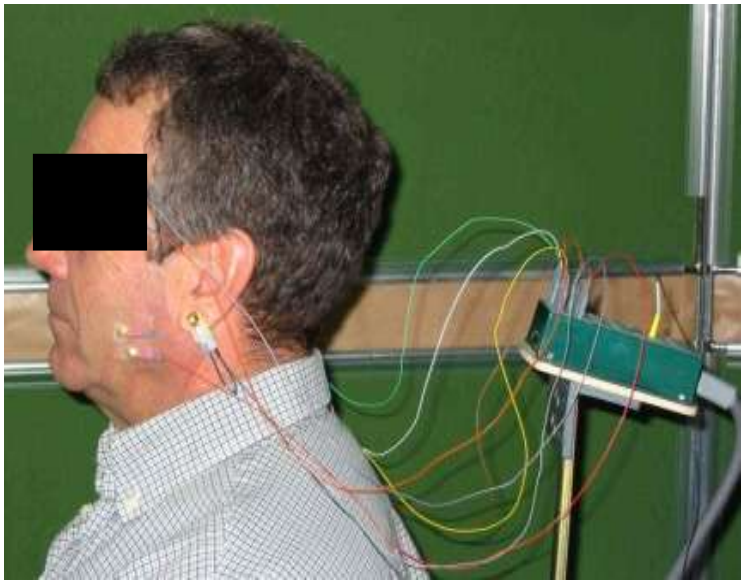


Saliva composition – 100 subjects

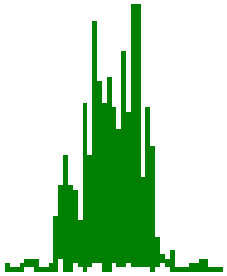




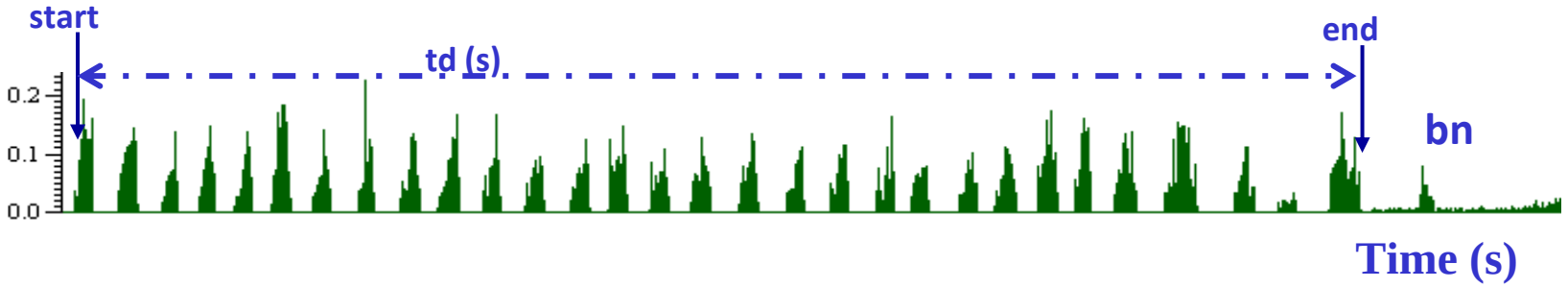
Food bolus trajectory: solid food – 50 subjects



tw (mV.s)

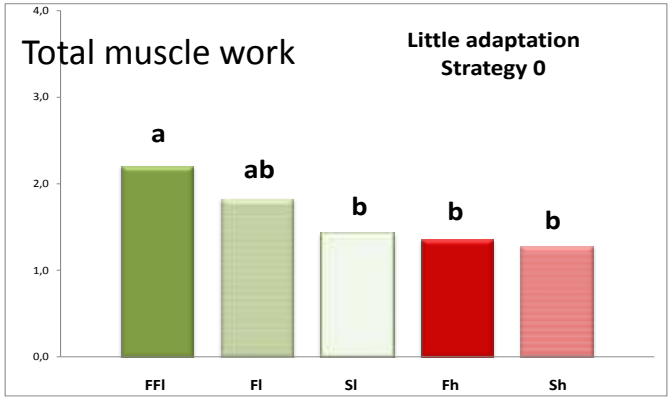


- Amplitude
- Total muscle work
- Total duration
- Burst number



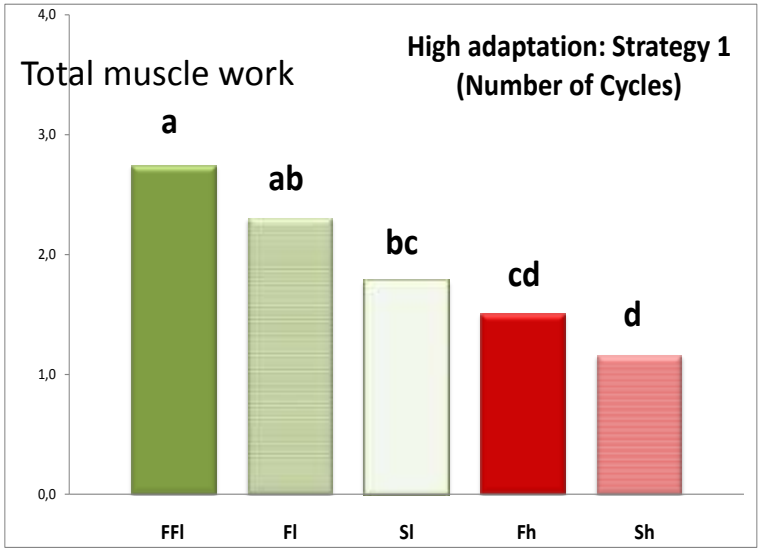
Food bolus trajectory: solid food – 50 subjects

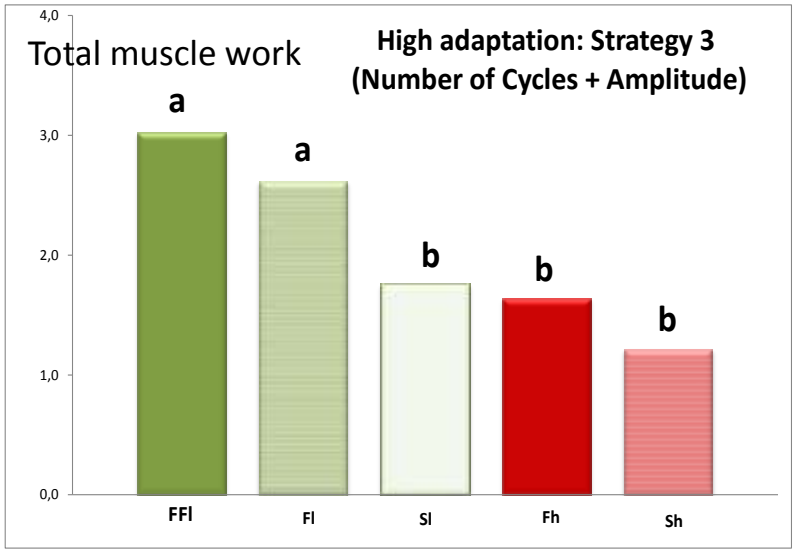
Yven et al, J.Text. Stud. 2012



Low fat cheeses

High fat cheeses





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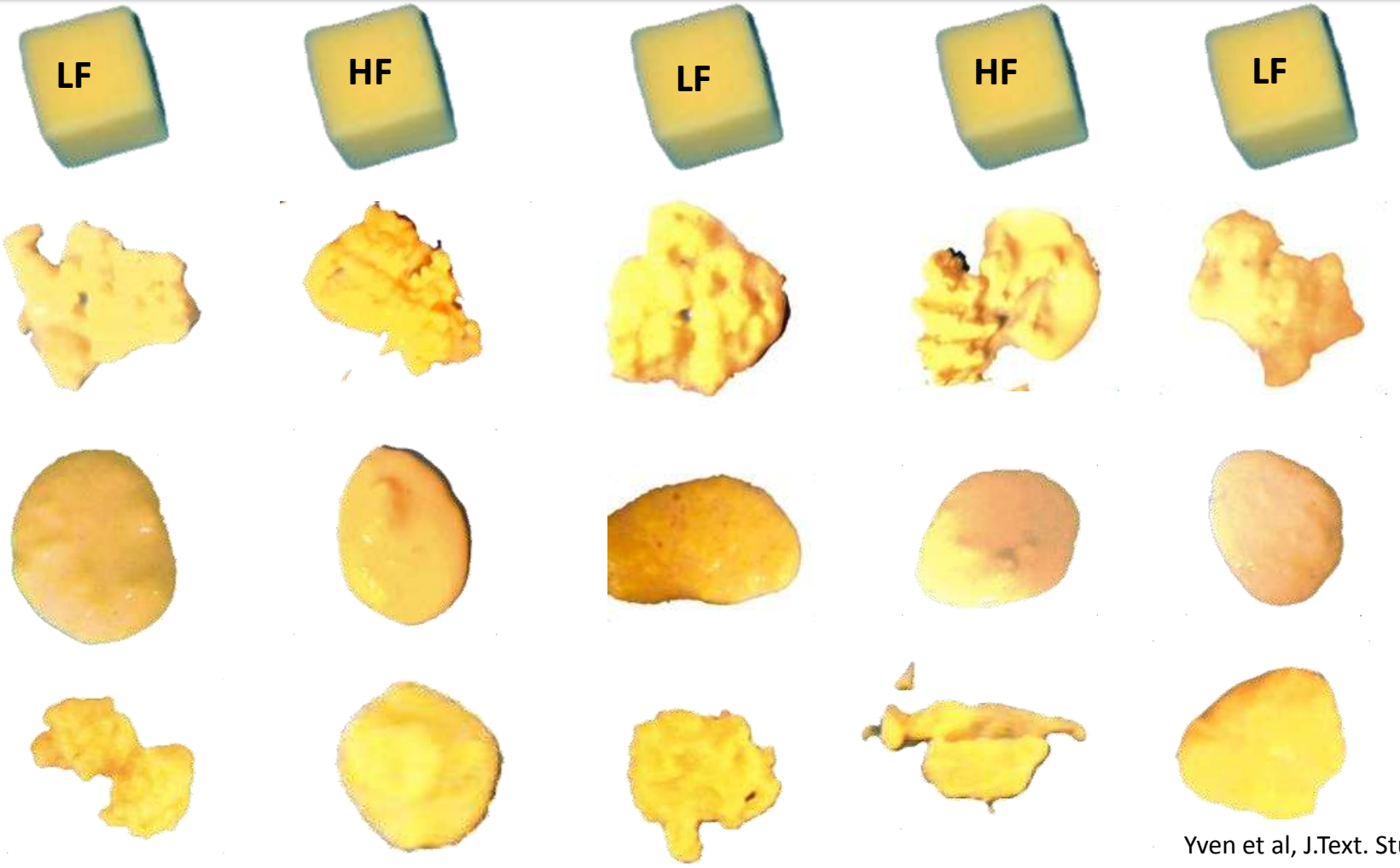
Food bolus trajectory: solid food – 50 subjects



Yven et al, J.Text. Stud. 2012

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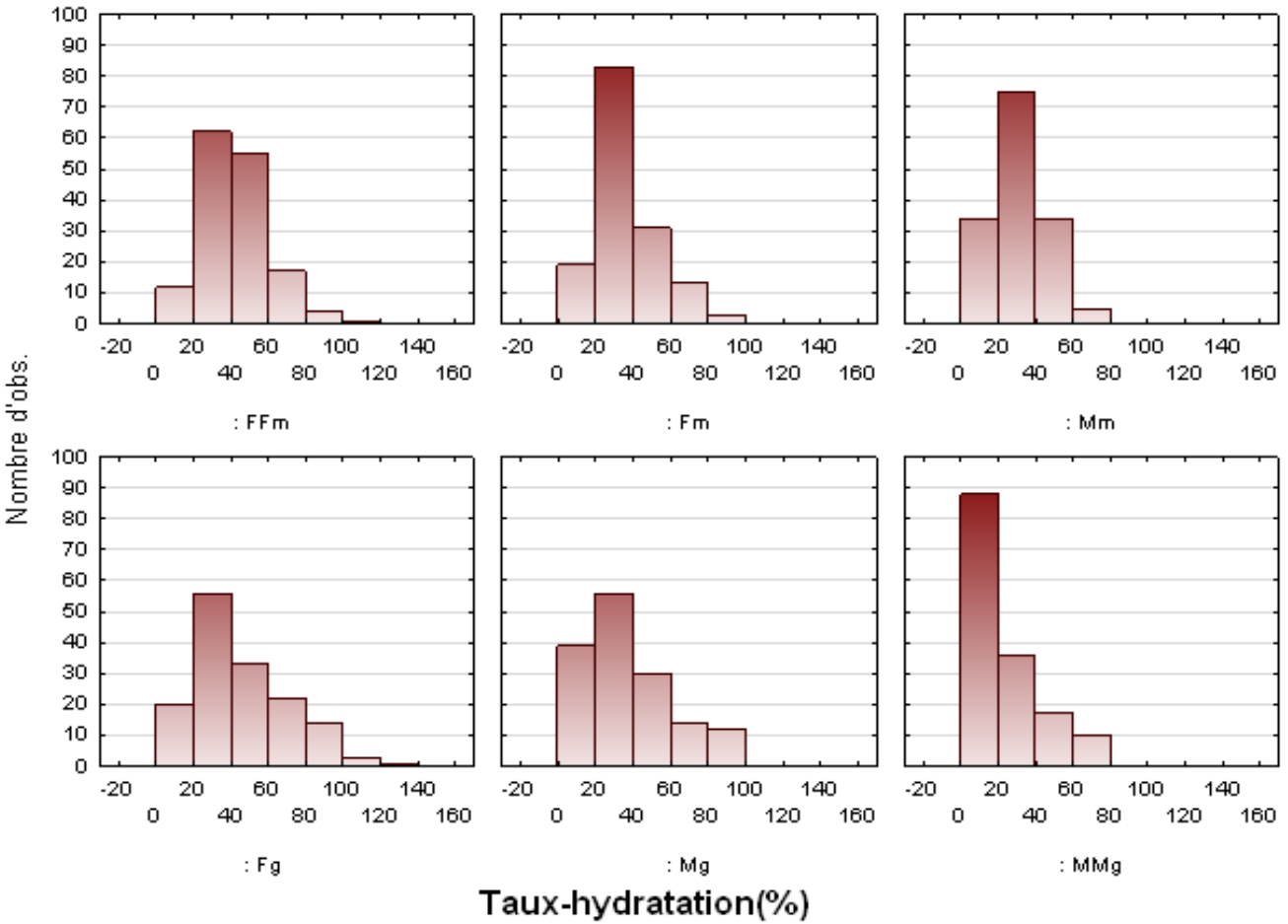
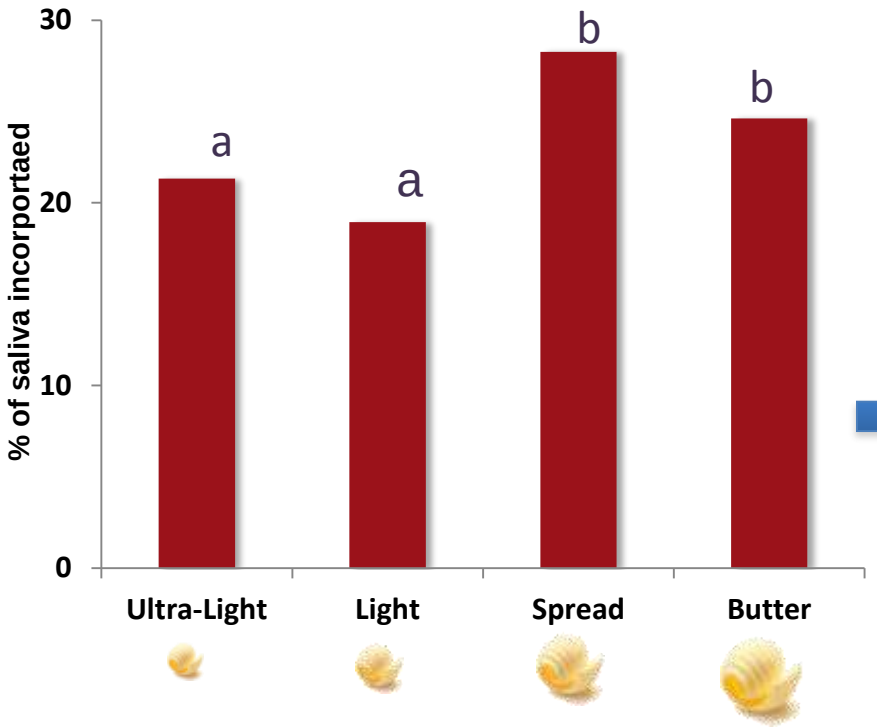
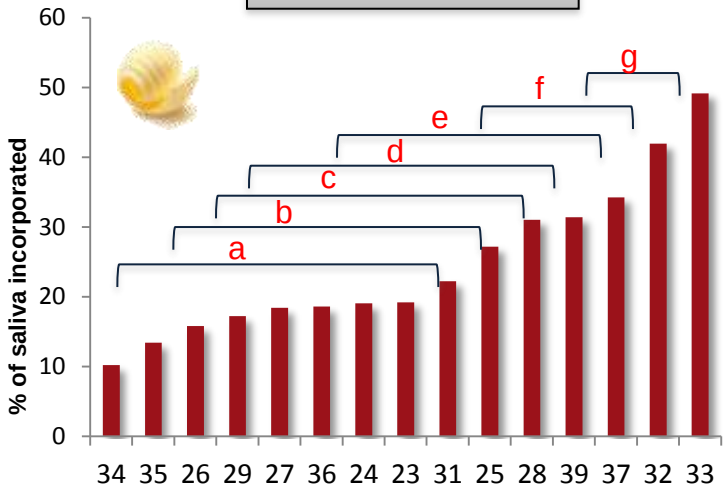


Food bolus trajectory: semi-solid/liquid food

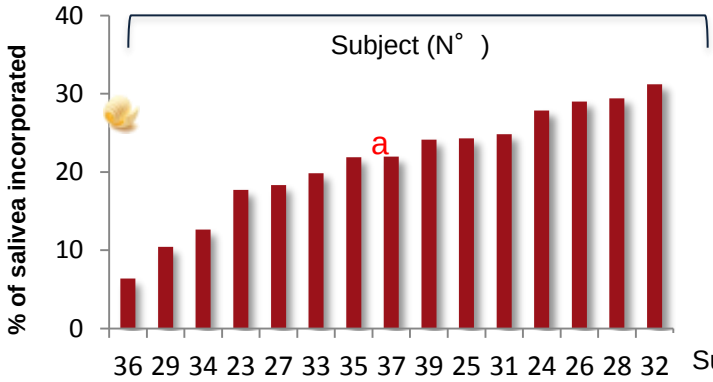
Product effect



Subject effect



7 groups



1 group

Food bolus trajectory: semi-solid/liquid food

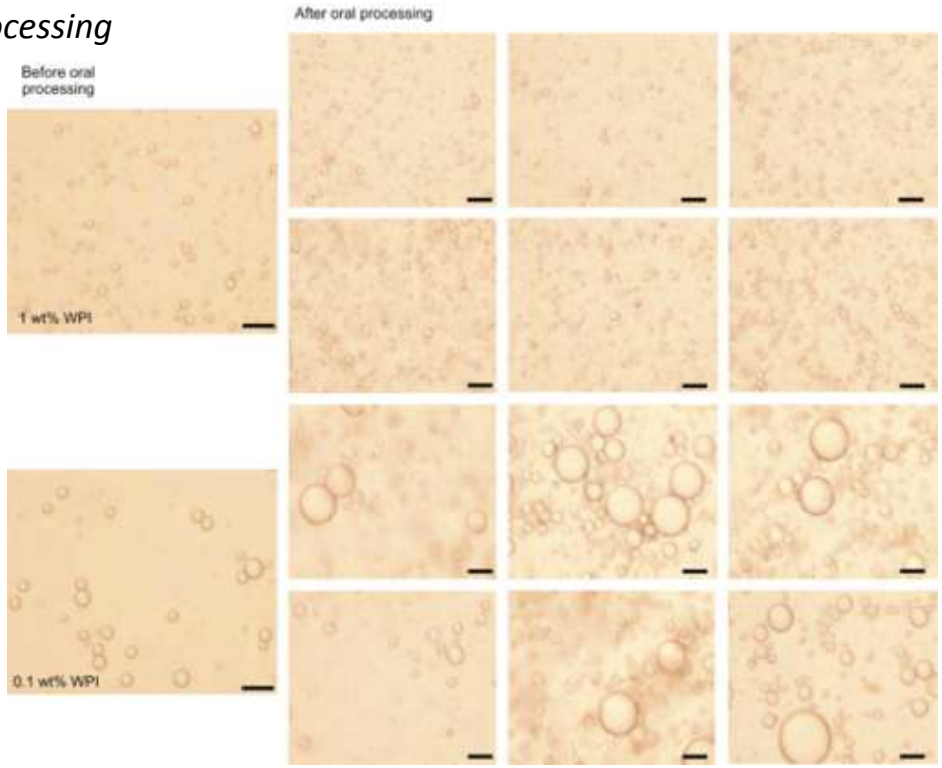
Fat retention at the tongue and the role of saliva:
Adhesion and spreading of 'protein-poor' versus 'protein-rich' emulsions

Diane M. Dresselhuis [a,b], Martien A. Cohen Stuart [b], George A. van Aken [a,c], Raymond G. Schipper [b], Els H.A. de Hoog [a,c,*]

Food Hydrocolloid 22, 1170 - 1183

Before Oral Processing

After Oral Processing



Coalescence induced by:

- Mucins
- Amylase
- Prolin Rich Protein
- Ions

- Shear forces
- Flux

Enhanced the coating on the tongue

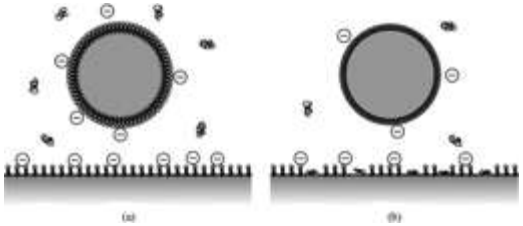
Coalescence +++

↓

Coating +++
Friction ---

↓

Creamy +++ Smoothy +++
Melting +++



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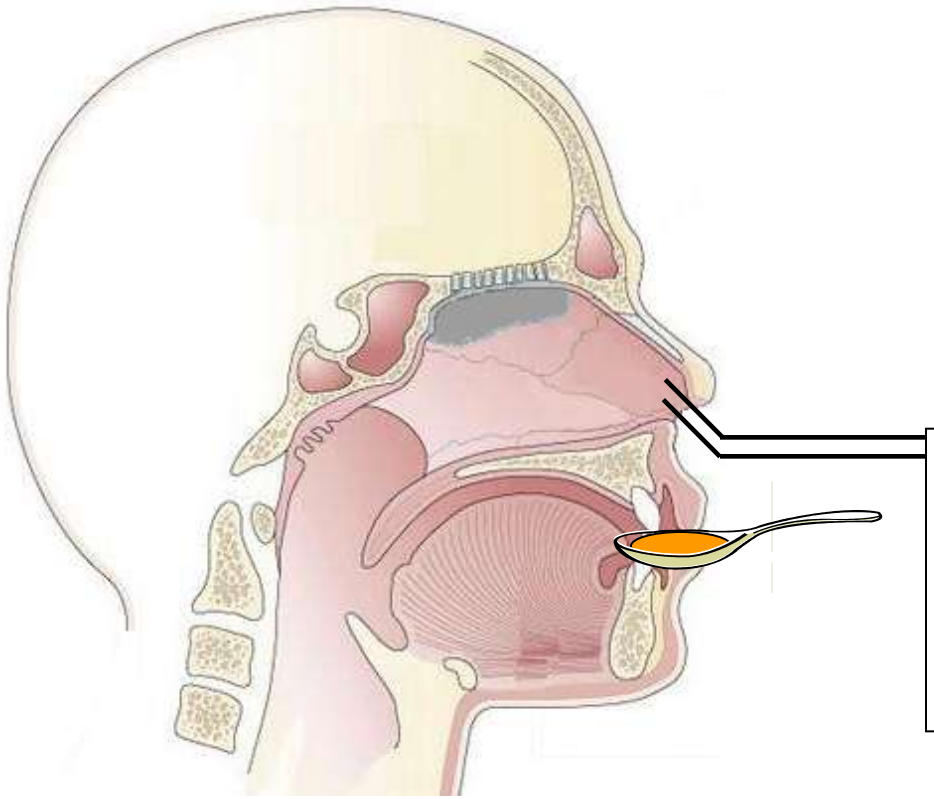
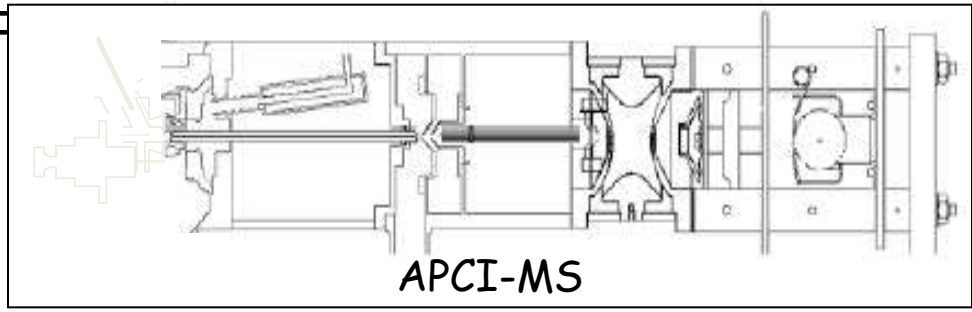
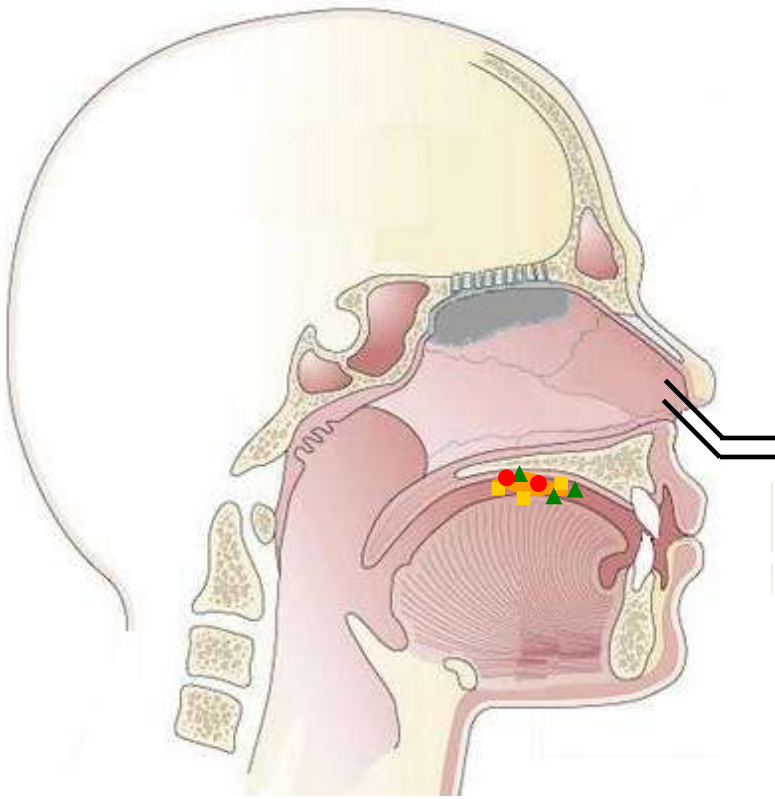
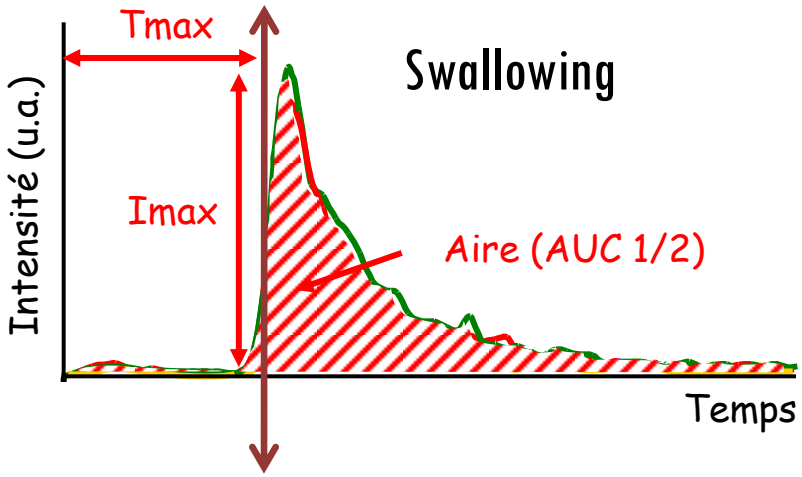
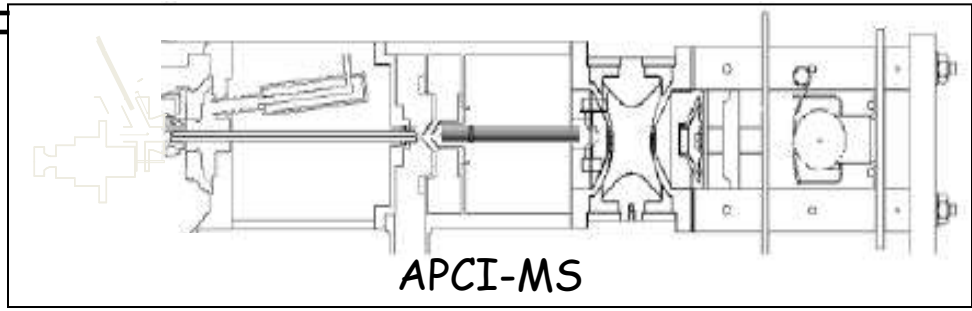
In vivo aroma release – 50 subjects











2 aroma compounds:
- Ethyl-propanoate
- Nonan-2-one

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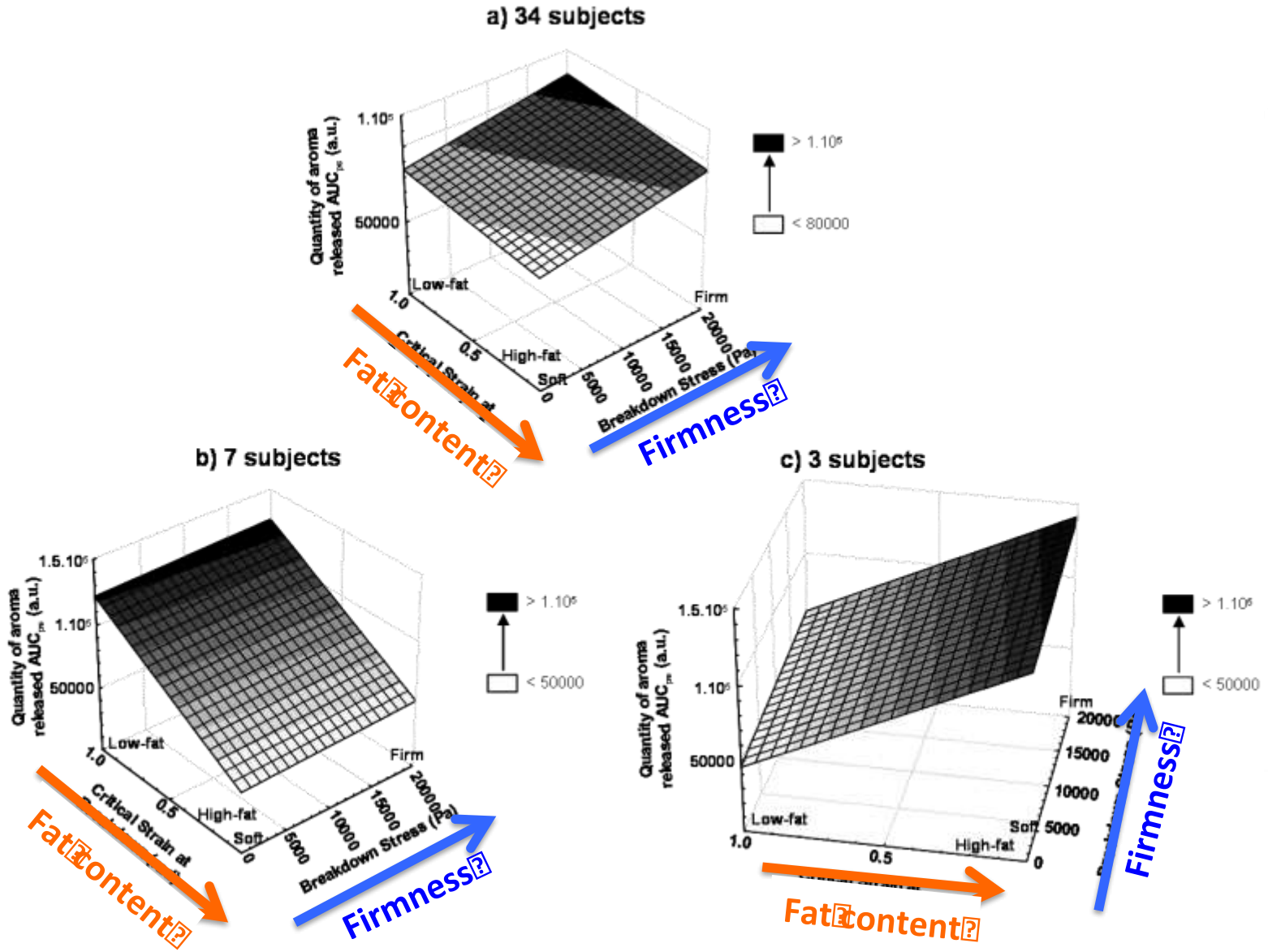
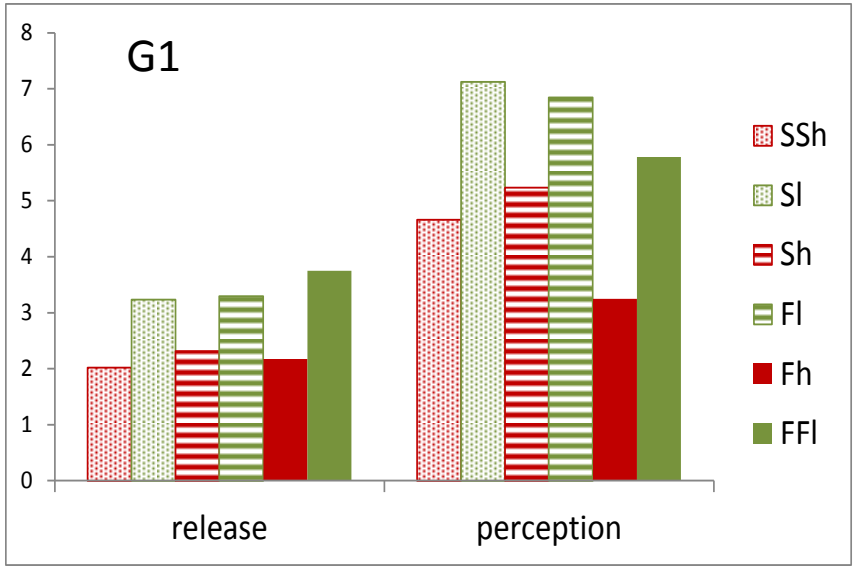
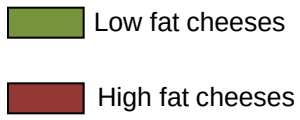
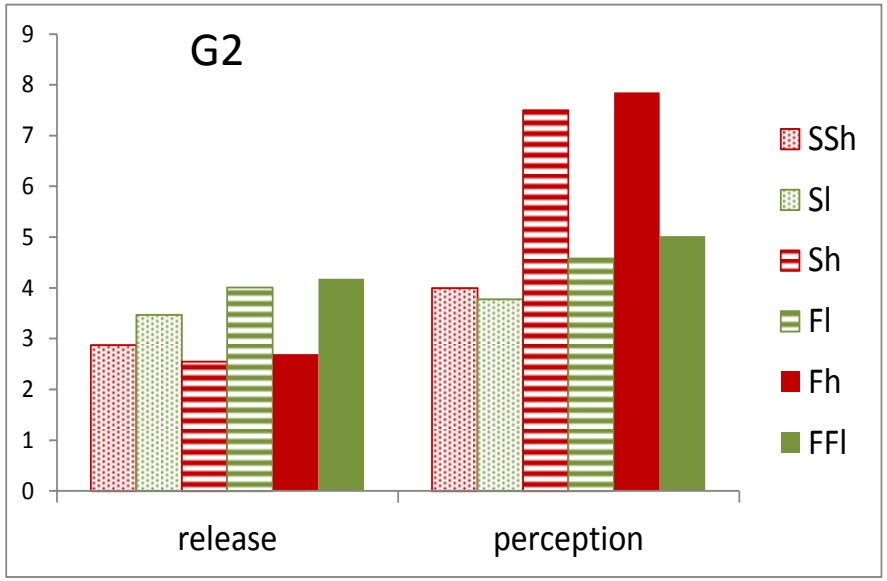
In vivo aroma release: subject (50) effect for nonan-2-one



Relationship between release and perception: nonan-2-one - 16 subjects







Guichard et al., 2013

Taste perception (sodium)

100 subjects well characterized

21 untrained Subjects variables regarding salt perception

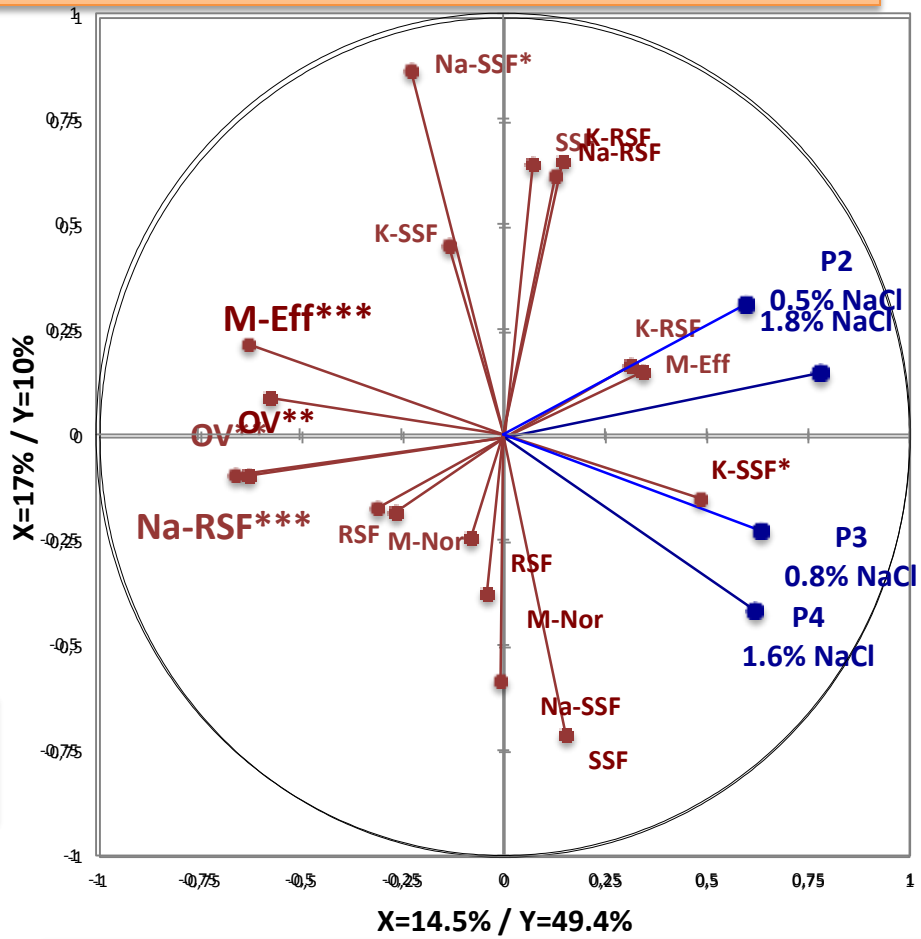
Saltiness
4 cheeses

Oral physiology
Saliva composition

0.5% - 0.8%
1.6% - 1.8%

Sodium, Oral volume, Masticatory, Flux

Data analysis
Partial Least Squares (PLS)



OV & ME explain saltiness perception the most for low salt

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cheeses
CARREFOURS DE L'INNOVATION AGRONOMIQUE

Taste perception (fat)

50 subjects

Saliva composition

Structure
- Amylase
- Proteolysis
- Lysozyme
- Proteins
- Flux

Taste
LCN1, Lipolysis

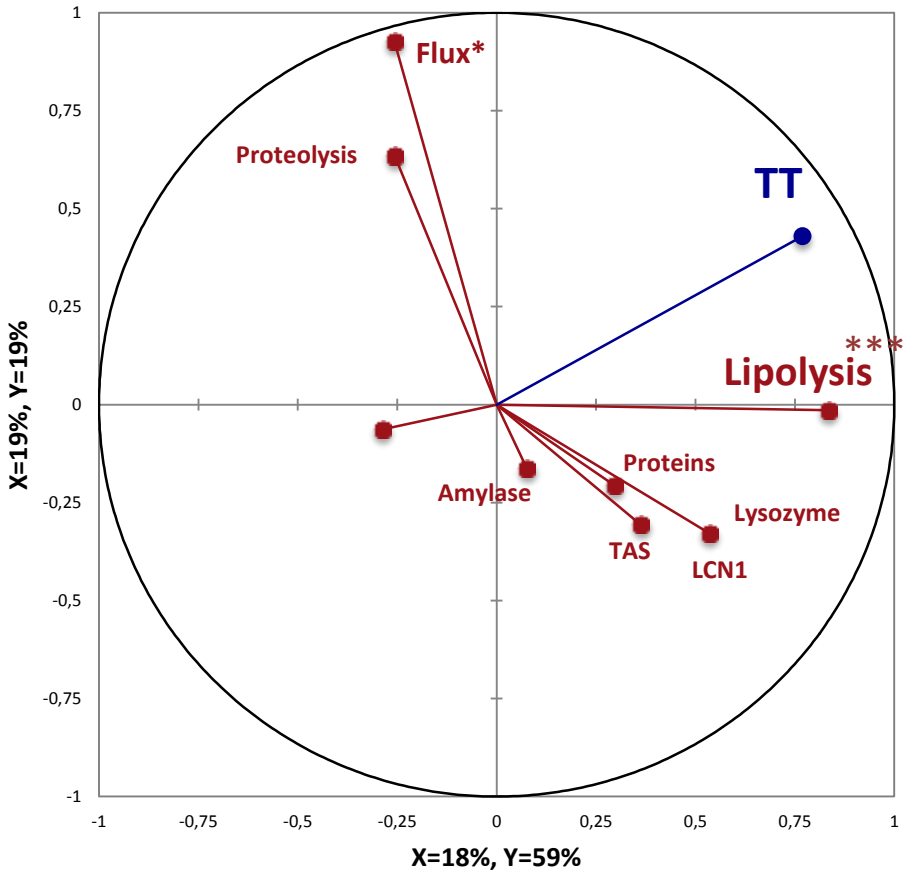
Olfactory
(TAS)

17 subjects

Threshold C18:1

Taste (with nose-clip) & Multimodal (without nose-clip)

Data analysis
Partial Least Squares (PLS)



Lipolysis explain oleic acid taste thresholds the most

Poette et al., Flav. Frag. J. 2013

Conclusions

These works point out:

- Complexity of FOP related physiological phenomenon involved during in-mouth aroma and taste releases and perceptions
- These phenomena are product dependant but also subject dependant. There is a real necessity to consider this last aspect on the different studies conducting on the field >>> large panel or inclusion criteria.
- Changes of FOP during life (infancy and elderly) ? How the product can influence FOP evolution ? What are the consequences on the evolution of flavour and taste perception ?

Acknowledgement

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- Faculté dentaire DIDO, Université d'Auvergne
- Laboratoire de rhéologie, CNRS
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- Sté St Hubert