



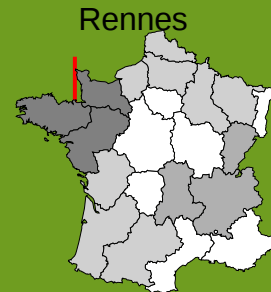
Joint Research Unit
INRA-AGROCAMPUS Ouest
Science and Technology of
Milk and Eggs (STLO)

From'Innov: a new concept for building cheese texture and taste separately for design-on-demand and short supply

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https://www6.rennes.inra.fr/plateforme_lait



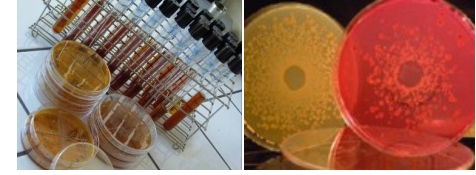


A multidisciplinary and multiscale approach, reinforced by two high-calibre facilities:

Dairy Platform



Biological Resource Centre



- ❑ **Structuration / destructuration mechanisms of food matrix:** *from structural characterisation to digestion*
- ❑ **Dairy processing, drying and cheese making:** *toward sustainable dairy systems*
- ❑ **Microbial interactions:** *food matrix and host cell*

From'Innov: a new concept to make cheese easily, quickly and efficiently

Outline

Why do we need to develop such a
concept?

How did we develop this concept?

Main results on textural and aromatic
features

From'Innov: why the need to develop such a concept

1. To simplify the process by decoupling the development of texture and flavour in order to control each of them separately
2. To propose new products with physical features, flavour and appearance
3. To optimize the process in a sustainable way:
 - To streamline production by reorganizing, optimizing and assembling different stages
 - To decrease inputs, ripening and salting
 - To standardize by-products by using a characterised membrane

Changes from traditional cheese technology to a new innovative method

Usual cheese making technology



Long time

Partial standardization

Coagulation



Draining whey

Salting

Ripening

Recall:

- ✓ « Traditional » cheese technologies have already been optimized and margins of progress are limited
- ✓ The interdependence of manufacturing factors limits the variety of flavour and the optimization of textural features
- ✓ Ripening time means a long production cycle and a short consuming period
- ✓ A variable composition of whey (valorization?)

How we developed From'Innov

Main objectives:

- ✓ **Simple:** all the stages are separated and independent
- ✓ **Flexible:**
 - From fresh to semi hard cheeses
 - We can change flavour, texture and appearance
- ✓ **Eco-designed:** streamline process
- ✓ **Nutritional:** biochemical ratios (fat, protein, minerals) and addition of pre or probiotics

D - 1

D

D + 1



Standardization

Coagulation

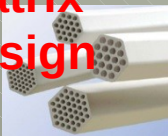
Drainage

Salting

Ripening

Long time

Matrix design



Flavour design



Pre cheese:

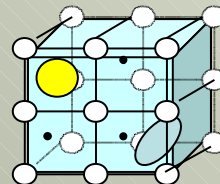
90%

+

Flavoured matrices:

10%

Texturizing



Textured matrix

Short time:

D + 1

From'Innov



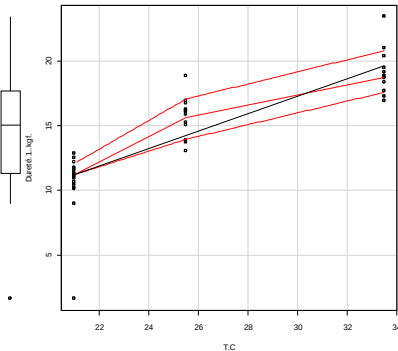
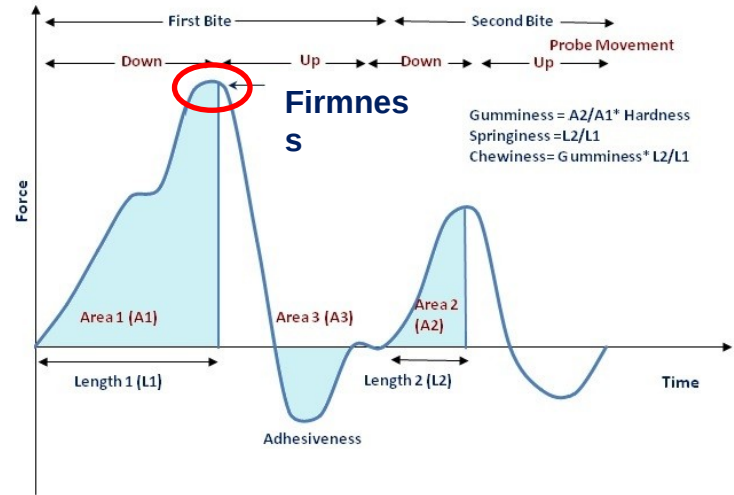
Results 1 -

Firmness

Firmness studied

by Texture Profile Analysis

- LLOYD Instrument texture meter TA +
- 50 N force applied on a 1 cm diameter disk

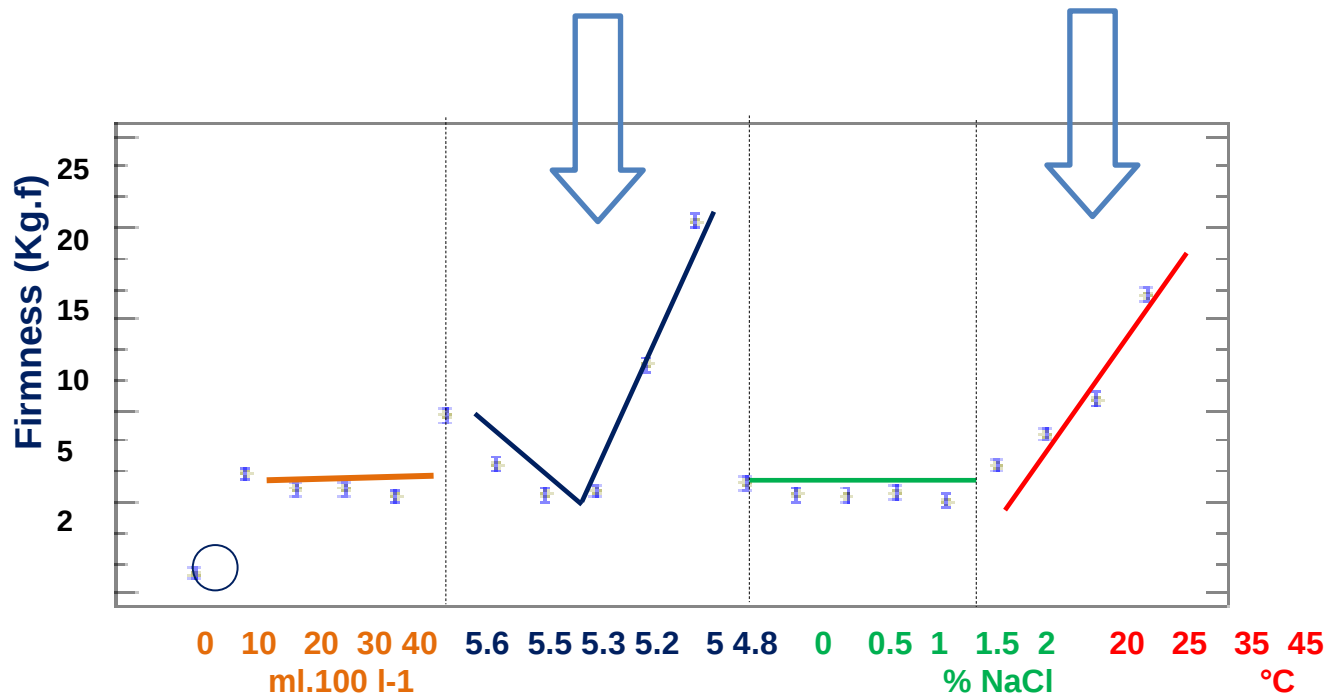


A wide range of textures was obtained from the same initial matrix

Firmnes

S

Results showed it is possible to obtain products with varying firmness from spreadable to semi hard cheese



Parameters: Coagulant dose

pH

NaCl

T°
C

Results 2-

Flavour

4 microbial species

chosen:

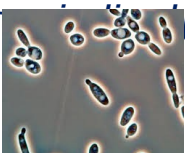
3 bacteria:

- ✓ *Lactococcus lactis* spp. *lactis* & *cremoris*
- ✓ *Propionibacterium* fr...
- ✓ *Hafnia alvei*



One yeast:

Yarrowia lipolytica



Growth under optimized conditions in dairy matrices to produce flavour compounds (substrate, T°, pH, O₂, ...)



Flavoured matrices added to pre-cheese, then texturation

Sensory evaluation



- ✓ 12 judges
- ✓ 5-point scale scoring

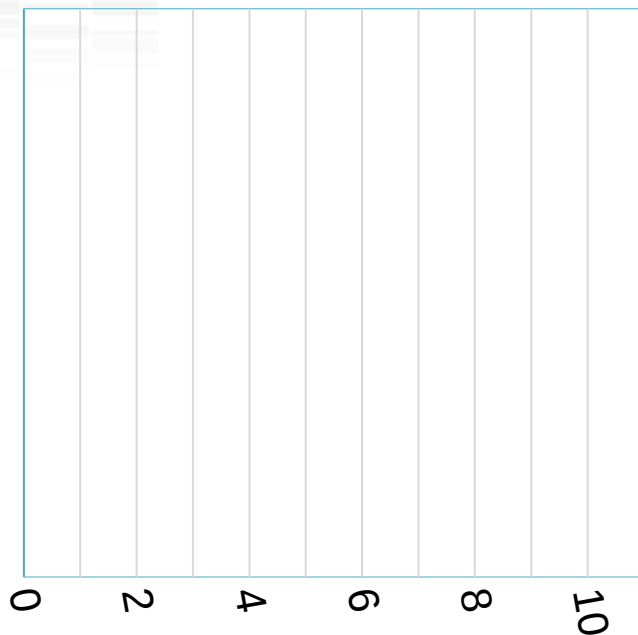
Analysis of volatiles

head space – gaz chromatography – mass



Results 2-

Flavour analysis (6% of flavor matrix)



Flavour Intensity score (mean 12 jud)

Descriptor
S

Mild

Butter

Cauliflower

*Lipolysed,
rancid*

complex

**GC-MS analysis of
flavour
compounds**

- ✓ Diacetyl
- ✓ Sulfur compounds
branched-chain
alcohols,
- ✓ Short-chain fatty acids
methyl ketones
branched-chain
aldehydes

Conclusion

- ✓ **No opposition** between traditional and new approach: both are complementary with different markets (cheese board □ culinary applications)
- ✓ This **eco-efficient** and **patented** process makes it possible
 - to control each step **independently**: coagulation, draining and ripening
 - to **streamline production** by reducing resources for production:
 - Single draining mode with membranes,
 - Ripening rooms = 50 to 70% of the building area in traditional dairy
 - to obtain **standardized by-products**: by using dedicated membranes (whey/variable □ permeate/constant)
- ✓ and consequently to **limit production costs**

Conclusion

- ✓ It is possible with the same equipment to produce various flavours and textures and to carry out cheeses **on demand from day to day, easily and quickly**
 - ✓ **Future works:**
 - ✓ To enlarge the range of flavors
 - ✓ To dry these matrices
 - ✓ Accurately to determine production costs
 - ✓ To understand the behavior of aromatic molecules and microorganisms into the matrix
- And
- ✓ To propose to small, medium or large structures this process
Brevet WO2016108024 [Garric, Jeantet et al]

Thank you for your attention

