Demonstration session on Salt reduced dry-cured ham

24th February 2010

IRTA - Monells, Girona, Spain

European Integrated Project within the Sixth RTD Framework Program (FOOD-CT-2006-016264):

Traditional United Europe Food - TRUEFOOD

www.truefood.eu

European Integrated Project
Sixth RTD Framework Program
(FOOD-CT-2006-016264):

Traditional United Europe Food - TRUEFOOD

TRUEFOOD aims to improve quality and safety and introduce innovation into Traditional European Food production systems through research, technology transfer, demonstration, dissemination and training activities.

Specific aim: to reduce salt content in dry-cured hams

TRUEFOOD structure

WP0 - OVERALL PROJECT CO-ORDINATION
SPES –Dr. D. Rossi

SCIENTIFIC PILLAR
INRA – Prof. G. Corrieu / Dr. J. Culioli

INDUSTRIAL PILLAR
ENEA - Dr. M. Leonardi

WP1
MATFORSK
Determination of consumer perception expectation and attitudes

WP2B
ENEA
Control of biologically derived and process induced chemical hazards

WP4
IRTA
Improving nutritional quality in line with consumer demand

WP5
UGENT
Improved mktg and supply chain organisation methods for TFPs

WP7
INRAN
Environmental, societal, human and economic impacts of innovation

WP2A
INRA
Innovation for improving microbial safety of TFPs of animal origin

WP3
AUA
Predictive modelling and risk assessment of TFPs

WP6
ACTIA
Pilot scale evaluation and **demonstration of innovations to industry**

WP8
SPES
Dissemination training and Technology transfer

AGENDA

09:00 General presentation of new technologies (P. Gou)

10:30 *Coffee break*

11:00 Demonstration of new technologies for the selection of raw hams (X. Serra, E. Lemoine)

11:45 Demonstration of new technologies for design of optimal process (E. Fulladosa, N. Garcia)

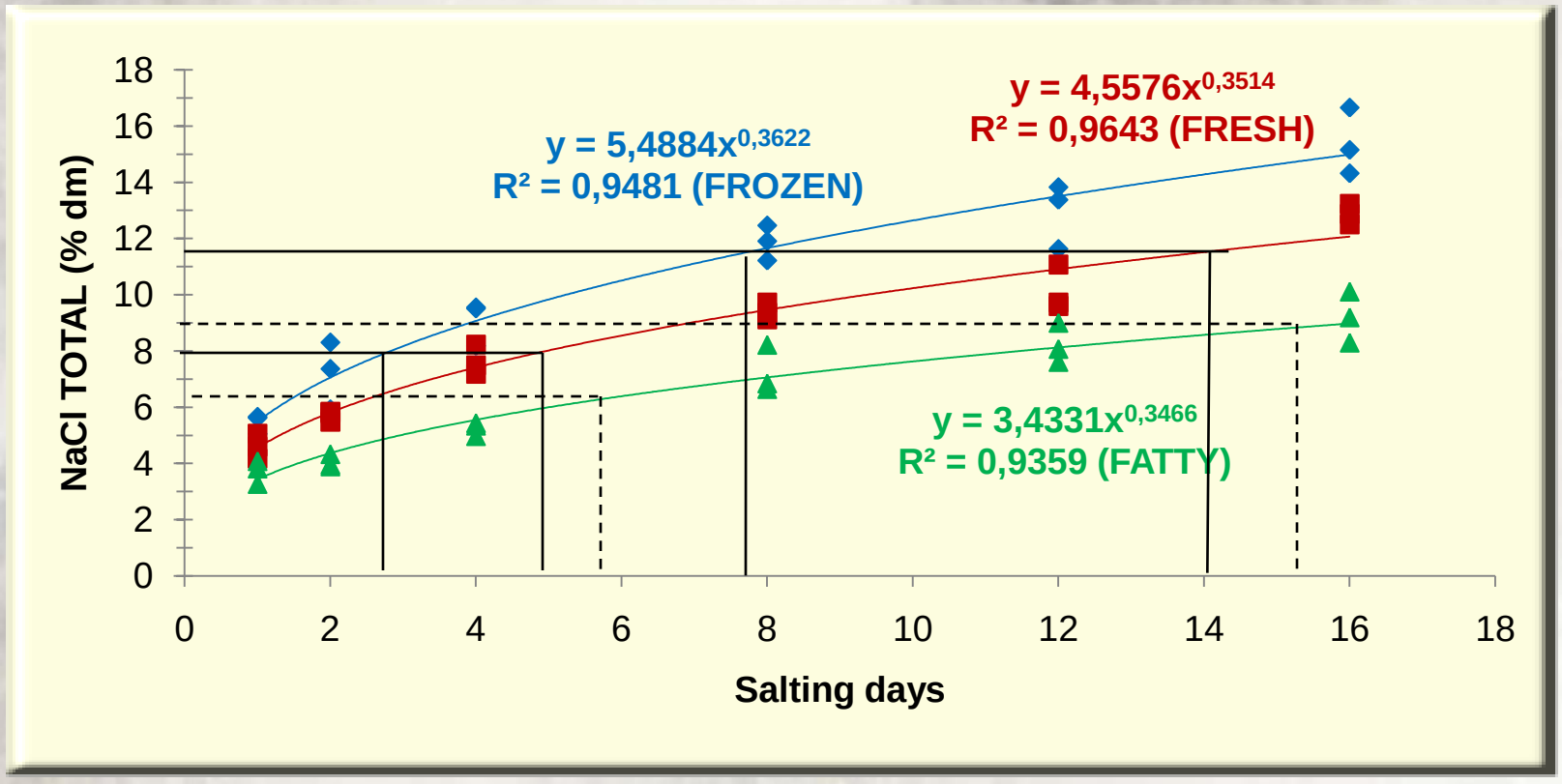
12:30 Demonstration of Boning-salting-binding methodology (X. Sala, E. Fulladosa)

13:30 *Lunch*

14:30 Demonstration of treatments on the final product (N. Garcia, X. Serra)

16:00-17:00 Round table

HOW to reduce salt content in dry-cured ham?



30 % salt reduction:

Fresh (14 d ➔ 5 d)
Frozen (8 d ➔ 3 d)
Fatty (15 d ➔ 6 d)

EFFECTS OF SALT REDUCTION

	SALTING TIME		
	6 d	10 d	14 d
Semimembranosus			
a_w	**0.908^{a}**	**0.901^{a}**	**0.884^{b}**
Water content (%)	52.63	51.66	49.88
NaCl (dm %)	6.87^{b}	9.62^{a}	11.24^{a}
Proteolysis (%)	**19.51^{a}**	**17.50^{b}**	**17.34^{b}**
Biceps femoris			
a_w	**0.933^{a}**	**0.912^{b}**	**0.890^{c}**
Water content (%)	63.46^{a}	60.72^{ab}	58.74^{b}
NaCl (dm %)	11.38^{c}	14.10^{b}	16.02^{a}
Proteolysis (%)	**28.32^{a}**	**24.62^{b}**	**22.43^{b}**

Gou et al. (2008) *Meat Science*, 80: 1333–1339

MAIN PROBLEMS RELATED TO SALT REDUCTION

Microbiological stability:

Salt affects a_w. It is necessary to combine different hurdles

Flavour:

Salt affects the perceived flavour

Excessive proteolytic activity:

Salt affects proteolysis activity

Increase of proteolytic activity ➔ soft texture, white film

TRUEFOOD APPROACHES

Selection of best raw material:

To select fresh hams less prone to be microbiologically contaminated and to have lower proteolysis activity ➔ To identify the right parameters and develop technologies for innovative on-line selection of raw hams.

Adapting the process:

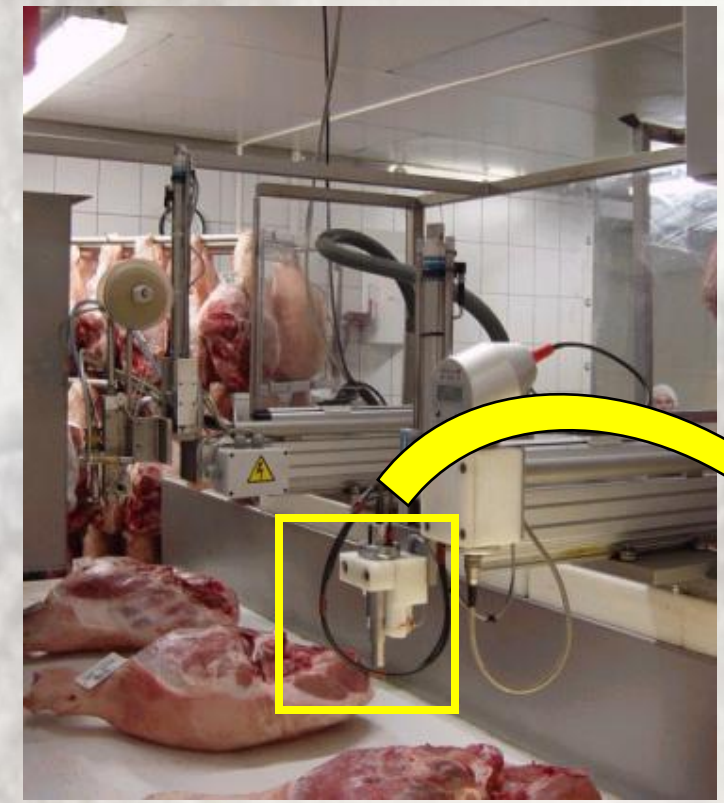
To apply longer periods at low temperature (post-salting) to stabilize the product from a microbiological point of view ➔ To develop an innovative non-destructive technology for monitoring the stability of the product and define the post-salting time according this information.

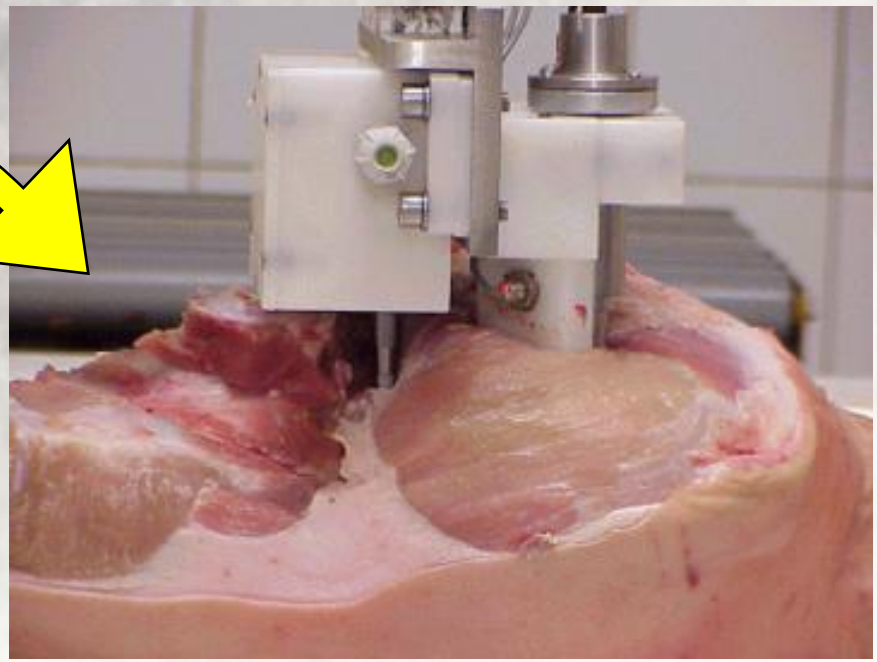
Treatments on the final product:

To identify and develop treatments which increase the microbiological stability and/or reduce problems related with an excessive proteolysis (soft texture and white film).

SELECTION OF BEST RAW MATERIAL

Meat Quality Scanner





SELECTION OF BEST RAW MATERIAL

Meat Quality Scanner

pH_{24}>6,20
. More prone to spoilage
. Bright, phosphate crystals
. Soft texture at high water content and hard texture at low water content. Adhesiveness

pH_{24}<5,6
. Red ring
. White film
. Worst slicing
. Pastiness

PSE
. Higher salt content

SELECTION OF BEST RAW MATERIAL

pH EFFECT AS A FUNCTION OF SALTING LEVEL

	Salting time	Group of pH_{SM24}		
		Low	Medium	High
Pastiness	6 d	2.9^{ax}	1.2^{b}	0.6^{b}
	10 d	0.1^{y}	0.4	0.5
	14 d	0.3^{y}	0.1	0.5
Slicing difficulty (% adherent slices)	6 d	(77.8)	(62.5)	(37.5)
	10 d	(28.6)	(0)	(0)
	14 d	(16.7)	(0)	(0)

SELECTION OF BEST RAW MATERIAL

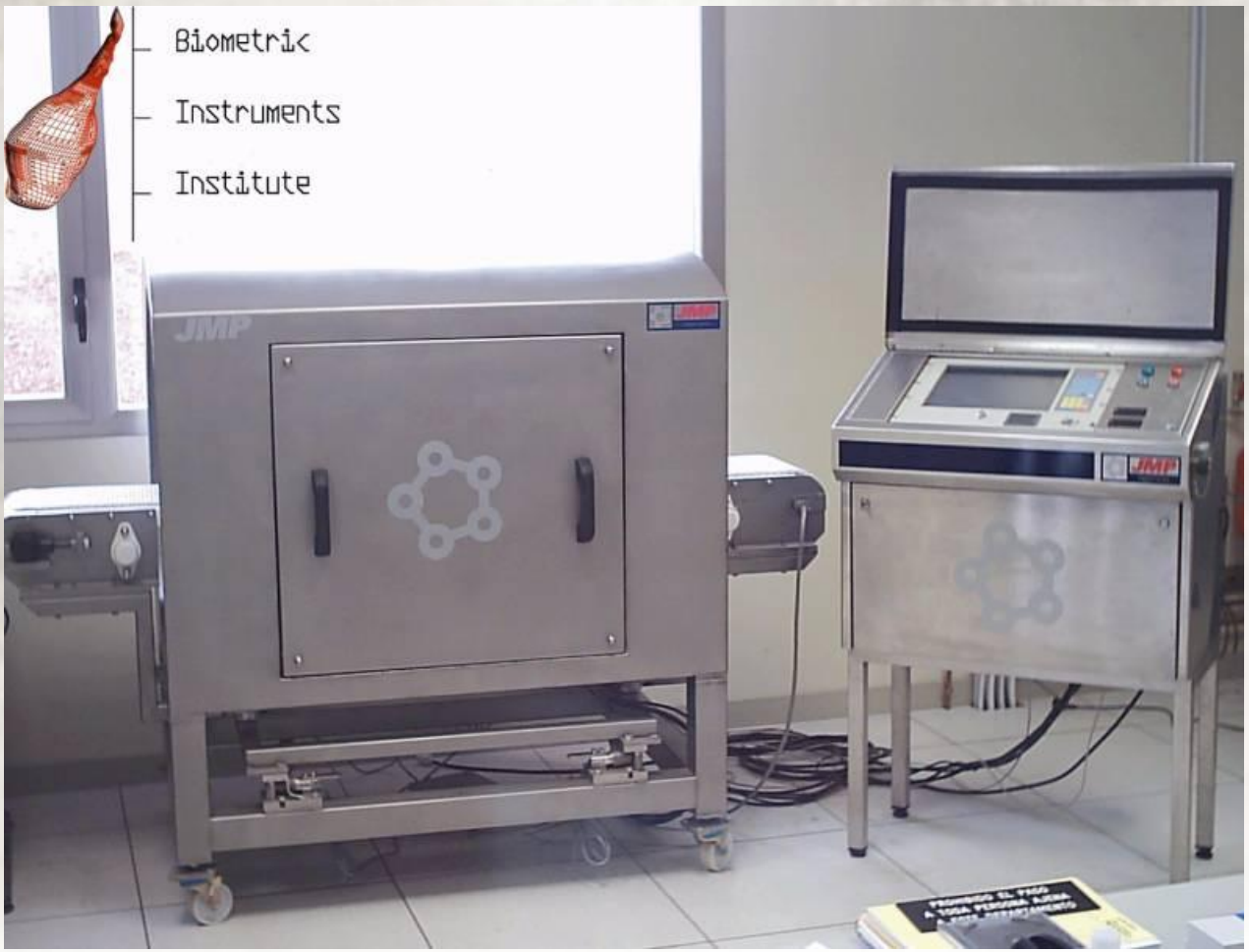
CHARACTERISTICS OF RAW MATERIAL AFFECTING THE SALTING PROCESS OF HAMS

- trimming
- surface shape
- **fat content**
- water content at the surface

SELECTION OF BEST RAW MATERIAL

FATNESS

CATEGORIZATOR EXPERT SYSTEM FOR HAMS (JMP INGENIEROS)



ADAPTING THE PROCESS

Post-salting time ➔microbiological stability

ETG ‘Jamón Serrano’
T: 0-6 ºC
RH: 70-95 %
time: min. 40 days

DO ‘Jamón de Teruel’
T: 3-6 ºC
RH: 80-90 %
time: 45-90 days
min. 1% of salt in the muscle

Control parameters

Dying chambers: T, RH, time

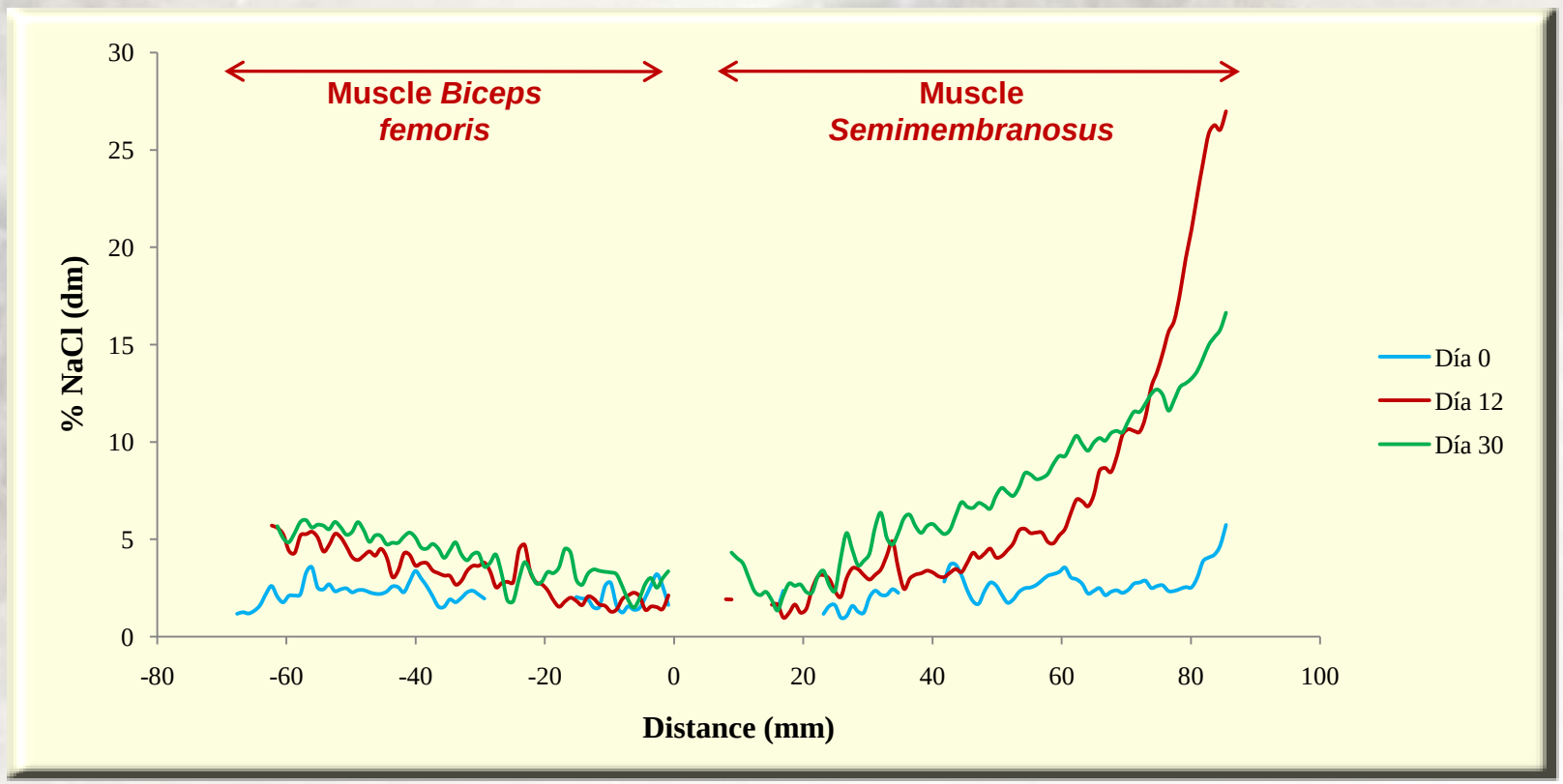
Product: weight loss, NaCl, water contents and a_w distributions

NON-DESTRUCTIVE METHODOLOGY TO ESTIMATE THE SALT CONTENT

Salt and water contents can be estimated non-destructively by Computed Tomography (CT), which permits the monitoring of the same product during all the processing.

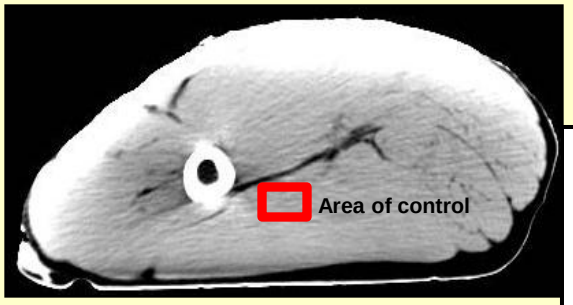
CT can be used as a tool for taking decisions in the critical points during the processing, and to design the correct process for new products, i.e., hams with reduced salt content.


Day 0
Day 12
Day 30


Muscle *Biceps femoris*
Muscle *Semimembranosus*
% NaCl (dm)
Distance (mm)
30
25
20
15
10
5
0
-80
-60
-40
-20
0
20
40
60
80
100
Día 0
Día 12
Día 30

EXAMPLE OF USE OF CT FOR DEFINING THE POST SALTING TIME

NaCl contents were monitored along the process by **CT**



Hams were kept in resting at 5 ºC and 75-80 % RH for different periods of time:

Control:

Traditional resting: 45 days ➔ 1.6% NaCl

Reduced NaCl content:

Traditional resting: 45 days ➔ 1.08 % NaCl

Adapted resting 1: to achieve a NaCl content of 1.4 %

Adapted resting 2: to achieve a NaCl content of 1.6 %

Kept at 10ºC until reaching 3.7% NaCl in BF

drying period at 15ºC to 22ºC to reach ≈ 35% weight loss

TREATMENTS ON THE FINAL PRODUCT

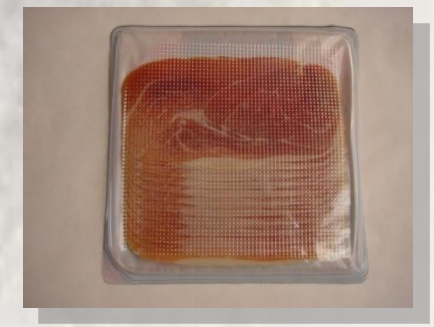
TEMPERATURES > 30 ºC

Values of Y_{90} (related with **soft texture**) of *biceps femoris* muscles from dry-cured hams (LpH: $pH_{SM24} < 5.7$; MpH: $5.7 \leq pH_{SM24} \leq 5.9$; HpH: $pH_{SM24} > 5.9$).

Temperature (last 10 days of processing)	Group of pH_{SM24}		
	LpH	**MpH**	**HpH**
18 ºC	0.70	0.71 ↓	0.71 ↓↓
30 ºC	0.69	0.67 ↓	0.65 ↓↓

	Salting Time		
	6 d	**10 d**	**14 d**
18 ºC	0.74 ↓↓	0.72 ↓↓	0.66
30 ºC	0.68	0.67	0.67

TREATMENTS ON THE FINAL PRODUCT



HPP TREATMENT

- **The HPP treatment:**

  a. Reduces the risk of Lysteria *monocytogenes*
  b. Increases the shelf-life
  c. Reduces pastiness and adhesiveness and increases hardness, fibrousness and gumminess
  d. Increases lightness, iridiscenses
  e. Increases the salty perception

- **The lower the water content of the slices, the lower are the HPP effects on sensory characteristics.**

HPP TREATMENT

Sensory parameters of dry-cured ham significantly affected by HPP treatment at 600 Mpa

Atributos	Control (n=10)	600 MPa (n=10)
Whole slice		
Colour homogeity	5.3	4.9
Brightness	4.2	4.9
Iridescences	1.1	3.4
Biceps femoris		
Hardness	3.4	5.6
Gumminess	1.8	4.4
Fibrousness	2.6	4.7
Adhesiveness	2.3	0.1
Pastiness *(incidence)	1.4 (10)	0.2 (4)
Saltiness	1.5	2.7
Umami	0.9	2.0
Sweetness	0.5	1.3

* Average of those samples that showed pastiness.

TREATMENTS ON THE FINAL PRODUCT

NEGATIVE TEMPERATURES

Thank you for your attention