

Ultrasound application for meat pickling, curing

innovative solutions for Short Food Supply Chains

Campden BRI Hungary

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Dissemination Level		
PU	Public	
PP	Restricted to other programme participants	
RE	Restricted to a group specified by the consortium	
CO	Confidential, only for members of the consortium	

1. Title of the case description

Ultrasound application for meat pickling, curing

2. Indicate your role in the Smart Food Supply Chain:

- individual member of the chain:
- chain operator:
- network operator:
- association:
- technical, scientific, or management expert:
- advisor:
- policy maker:
- other:

3. Indicate the region (if applicable): world-wide applicable

4. WP2 Cross-reference table

Please indicate with an X in the relevant box of the matrix for which needs and the steps / functions of the supply chain the described innovative solution is applicable

		Individual steps of the SFSC							Short food supply chain as whole						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Needs of the consumers (citizens)	food safety														
	food quality														
	trust														
	ethical aspects														
	accessibility														
Needs of the chain actors	fair price														
	increased negotiating power														
	shared use of available resources														
	product development support														
	access to markets and consumers														
	access to infrastructure														

- 1: Farming**
- 2: Primary production**
- 3: Transport**
- 4: Processing and packaging**
- 5: Storage**
- 6: Logistics**
- 7: Sale**
- 8: Product integrity, authenticity, transparency**
- 9: Marketing concepts**
- 10: Food chain management and networking for enhancing cooperation among chain actors**
- 11: Business modelling**
- 12: Policy environment**
- 13: Legal requirements**
- 14: Labelling**

5. Short description of the innovative solution

- **Describe the specific need or problem being addressed by the case and please explain what is the novelty of this innovative solution**

Meat quality depends on aroma, taste, texture, appearance, and juiciness. During the traditional pickling method the curing time (the time of diffusion of salt and pickle liquor) takes relatively long time, otherwise the natural diffusion to the product's bulk is relatively difficult. The consistent quality by pickled/cured products is an expectation. Pickling has preservative impact on meat products. The different pickling conditions within the meat product (between the product's bulk and surface) can cause microbiological risk.

- **Describe the enabling function(s) and the practical benefit(s)-(e.g. for which types of problems and opportunities is used and can it be used, and how)**

The high intensity ultrasound offers an alternative method in the food preservation and is regarded as a green and promising technology. The ultrasound generates chemical, physical, or biological effects, generates acoustic cavitation in the liquid bulk and develops changes in the material/structure of the medium. It makes the meat's fibers light and slack. In the meat ultrasound increases the diffusion, subserves the tenderization, thereby the meat curing is more effective in quality and also in time (accelerated pickling/curing time). It is also a way to meat aging-method, it improves the quality properties of the meat. Moreover, the high energy ultrasound can improve the microorganism-reduction effect in the meat too.

Sonication improves tenderness juiciness water-holding capacity extraction of myofibrillar proteins sensory characteristics microbial disinfection

- **Describe what makes the innovation work.**

High-intensity ultrasound application during meat marination has been frequently studied. Meat marinades may contain salt in two forms: dry or wet. High-intensity ultrasound application resulted favorable for salt diffusion when used in wet marinades. The effect of power ultrasound on pork during wet marination depends on the ultrasound intensity applied. Ultrasound causes bubble formation that hits the tissue, which may lead to microinjection of brine into the sample. This effect may help to explain the observed increase of NaCl content in the ultrasonicated meat.

Ultrasonic treatment (low-intensity and low-frequency) and the use of vacuum caused favorable microstructural changes in pork loins marinated in sodium chloride and these effects are highly dependent on the intensity of ultrasound treatment. Some of the critical factors in food processing warrant consideration because ultrasound generates rapid changes in temperature and pressure (109°C/s) over short time periods. Furthermore, cavitation generates shock waves, which contribute to this effect. Factors that modulate the effects of ultrasound application include time of exposure, processing volume, and sample composition.

- **Describe the specific prerequisites for the business related to the implementation of the method and/or related to the location, method, procedure, solution**
 - a: **List the relevant necessary resources (including the estimated cost) for the specific innovation.**
Please list the relevant ones only (list is annexed)
 - b: **List the relevant necessary capabilities for the specific innovation.**
Please list the relevant ones only (list is annexed)

6. Describe the results, achievements and typical failures

7. Summarize what makes the case to a good practice for the members of the SFSCs (e.g. lessons learned)

8. Aspects, methods for transfer of methods for other SFSC members

9. Recommendations for members of other SFSCs for further applications

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10. More information is available at (web), if it is relevant

- Ultrasound application to Improve Meat Quality, 2018

By Alma D. Alarcon-Rojo, Esmeralda Peña-González, Iván García- Galicia,
Luis Carrillo-López, Mariana Huerta-Jiménez, Raúl Reyes- Villagrana and
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- https://www.hielscher.com/food_01.htm

Annex

1. Checklist for necessary resources (tangible and non-tangible):

- materials (access to: raw materials/ ingredients - including volume, land – including size, packaging materials)
- human: labour force: size, knowledge & skills (production, technical, marketing, managerial, ICT, financial, etc.)
- technology: patents, know-how, trademarks, copyrights, trade secrets
- infrastructure, equipment, facilities, - size, minimum volume of production/sales, IT infrastructure
- information, reputation, brand, trust
- financial*

*: estimated cost:

0 - 10 000 Eur
10 001 - 50 000 Eur
50 001 - 100 000 Eur
100 001 - 300 000 Eur
300 001 – 1 000 000 Eur
1 000 000 Eur above –

- other specific necessary resources for the application of the specific innovation

2. Checklist for the necessary capabilities

- **food safety:**
 - basic skills to comply with the EU food safety regulations
 - ability to understand what makes the product safe (the key controls, which ensure the safety of the product – biological, chemical and physical hazards, providing the safety shelf life of perishable products)
 - food safety culture (motivation, responsibility for food safety) and basic skills for the implementation of HACCP

- **food quality:**
 - ability to define the target segments of consumers for SFSCs
 - ability to define the product characteristics which are (tacit) basic requirements for the target segment(s) of consumers;
 - ability to define which product attributes/levels and augmented services represent an added value for the target segments of consumers;
 - food quality culture (motivation, responsibility for food quality);
 - production experiences which help to provide the expected quality reliably, uniformly;
 - ability to provide distinguishable quality which meets the needs of the targeted consumer segment;
 - meeting (local) legal requirements, application of the labelling rules;
 - ability to access the consumer willingness to pay for specific products of SFSCs.

- **trust:**
 - ability to ensure product integrity, authenticity and transparent information for the consumers (including systems, tools);
 - ability to access external trust enhancers (third party certification, internal certification system, participatory guarantee systems);
 - application of the labelling rules and branding (mandatory and voluntary);
 - ability to meet third party certification requirements

- **ethical aspects**
 - ability to understand consumer needs for ethical behaviour related to the specific product(s) of the SFSCs;
 - culture for ethical food production and supply;
 - ability to implement necessary measures to ensure ethical food production and supply;
 - ability to access the consumer willingness to pay for products meeting ethical aspects

- **accessibility to consumers:**
 - ability to organize logistics efficiently and to exploit innovative solutions and distribution channels;
 - efficient, innovative sales methods;

- ability to develop and implement new business models for ensuring access of consumers to products and augmented services;
- **fair price:**
 - collecting marketing information;
 - ability to enhance and maintain cooperation among chain actors including the combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management;
 - ability to define, develop or maintain unique quality of products and augmented services;
 - ability to develop and implement new business models;
 - ability to access the consumer willingness to pay for fair price
- **increased negotiation power:**
 - collecting marketing information;
 - ability to enhance and maintain cooperation among chain actors including the combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management, cooperation culture;
 - ability to define, develop or maintain unique quality of products and augmented services;
 - ability to develop and implement new business models;
- **shared use of available resources:**
 - ability to enhance and maintain cooperation among chain actors including the shared and combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management, cooperation culture;
 - the level of value chain management culture;
 - ability to access the consumer willingness to pay for food with reduced environmental impacts

- **input for R+D:**
 - ability to monitor, research, evaluate, and understand the needs and wants of customers and consumers;
 - ability to develop new products, processes, packaging, preservation techniques, systems and access to new markets, including in other categories;
 - access to innovative technologies; distribution and marketing solutions and methods. management systems;
 - access to local input for R+D covered by other aspects

- **access to markets: and market success**
 - effective promotion, customer service, efficient and innovative sales methods;
 - ability to understand consumer's needs;
 - ability to organise logistics efficiently and to exploit innovative solutions and distribution channels,
 - unique value propositions;
 - ability to develop and implement new business models for ensuring access of consumers to products and augmented services, develop the market accessibility for the suppliers.
 - stock control;
 - ability to access to required raw materials within a restricted geographical area

- **access to infrastructure:**
 - ability to use existing own infrastructure in a focused way to serve consumer needs or to combine it with complementary infrastructures of other SFSC actors, cooperation culture;

- **management:**
 - to implement management systems for vision, planning, implementing), coordinating, controlling, monitoring, continuously;
 - improving; ability to motivate, authorize staff;

- **production, processing:**
 - management system, production experience, specific controlling, monitoring, continuously;
 - willingness to consider and ability to evaluate the adoption of TECI and NTI in the current production processes;
 - any additional specific resources necessary for the application of the specific innovation.