WP2 Reduction of fat and sodium in cooked and dry-fermented sausages

Summary
WP2 Objectives

• Develop production procedures for nutritionally improved cooked and dry fermented sausages while:
  – maintaining sensory perception and consumer acceptance of the original products
  &
  – ensure food safety and quality

• Reduction goal - cooked sausages:
  – 50% reduction in sodium and fat content

• Reduction goal - dry fermented sausages:
  – 30% reduction in sodium and 60% reduction in fat content
Cooked sausages

Initial phase: evaluate effects of different variables

- **Meat raw materials:**
  - Pork 23% fat
  - Pork 6% fat
  - Beef 14% fat

- **Pre-salting (1% NaCl):**
  - None
  - 2 days

- **Salt concentration:**
  - 0.9% NaCl
  - 1.5% NaCl

- **Emulsions**
Cooked sausages

Functional properties:

Salt < 1% unacceptable texture
Beef gave higher cooking loss and increased hardness compared with pork
Cooked sausages

Second phase, pilot study:

- **Mixed design:**
  - **Salt**
    - 1.0% NaCl
    - 1.3% NaCl
    - 1.6% NaCl
    - 1.8% NaCl
  - **Fat**
    - 0.9%
    - 1.2%
    - 1.6%
    - 1.8%
  - **Emulsion**
  - **Pre-rigor salting**

**Sensory evaluation:**

- Lowest level of fat and salt were discarded
- The assessors were not consistent when comparing with Standard sausage
- No effect of pri-rigor salting
Cooked sausages

Third phase: Pilot production, full scale

- 2 levels of fat
- 3 levels of sodium

Batter size 200kg

1) 18% fat, 2.2% NaCl  
2) 18% fat, 1.4% NaCl + 0.4% KCl  
3) 18% fat, 1.2% NaCl + 0.6% KCl  
4) 14% fat, 1.8% NaCl  
5) 14% fat, 1.4% NaCl + 0.4% KCl  
6) 14% fat, 1.2% NaCl + 0.6% KCl  

(Standard product)
Cooked sausages

Sensory analysis, 6 different recipes

1) 18% fat and 1.8% NaCl
2) 18% fat and 1.4% NaCl
3) 18% fat and 1.2% KCl
4) 14% fat and 1.8% NaCl
5) 14% fat and 1.4% NaCl
6) 14% fat and 1.2% KCl
Cooked sausages

Sensory analysis, 5 recipes

Doughy texture *
Sour flavor *

2) 18% fat and 1.4% NaCl
3) 18% fat and 1.2% KCl
4) 14% fat and 1.8% NaCl
5) 14% fat and 1.4% NaCl
6) 14% fat and 1.2% KCl
Conclusion cooked sausages:

- There are no technical problems to make sausages with 50% reduction in fat and sodium. However, it is questionable whether consumers will buy them.

- We have achieved a decrease in fat by 22% and sodium by 45% without reducing sensory or functional quality significantly.

- A reduction by 50% seems not economical feasible.
Dry fermented sausages

Objective:

- 60% reduction in fat content - saturated fatty acids (SFA)
- 30% reduction in sodium

snacks of fuet

chorizo extra
Dry fermented sausages

Labeling has been a driving force

- To obtain the claims «reduce in salt» and «reduce in fat» according to the regulation (EC) N°1924/2006:
  
  - 25% of salt
  - 30% of SFA

compared to reference nutritional composition in salt and SFA of similar products representative to Spain market
• **Part I : Industrial Technological tests at pilot scale before ADIV tests**
  – Test of strategies to select the most suitable fat emulsions
  – Test of salt reduction using KCl and fat reduction using lean meat

• **Part II : Technological tests at pilot scale**
  – **Reduction of salt content by 30%** compared to Spanish current products by applying 3 strategies:
    • Partially substitution of NaCl by KCl and masking the bitter tastes by yeast extracts addition as flavour enhancers
    • Using of dried meat as dehydrated pork meat powder
    • Sausage pre-drying at low temperature
  – **Reduction of SFA content by 60%** compared to Spanish current products by applying 3 strategies:
    • Producing lean products
    • Addition of vegetable oil and fibre
    • Using of fat emulsions (pork fat and/or oil / water / animal protein)

• **Part III : Industrial technological tests and sensory product quality and consumer acceptance**

• **Part IV : Challenge test**
  – assess microbial status of the best technological strategies of combined salt and fat reduction defined for snacks fuet. The safety of products and process was thus validated.
Dry fermented sausages

- Part III, sensory test, industrial scale, in Spain
  - Trained sensory assessors

Snack of fuet  
Chorizo
Dry fermented sausages

• Evaluation by 100 consumers
  - 49% male
  - 51% female
  - between 18 and 65 years

Snack of fuet

• 99% of consumers affirm that they would buy the reduced snack fuet
• 89% of consumers affirm that they would buy the reduced chorizo

Chorizo
Dry fermented sausages

- Challenge test Snack of fuet, for bacterial control
- 3 different processes

<table>
<thead>
<tr>
<th>Products</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snacks fuet</td>
<td>T : Control</td>
</tr>
<tr>
<td></td>
<td>E1 Norm : 40% salt substitution by KCl + Sunflower oil + fibers + Yeast extract addition</td>
</tr>
<tr>
<td></td>
<td>E1 cold : Cold predrying + 40% salt substitution by KCl + Sunflower oil + fibers + Yeast extract addition</td>
</tr>
</tbody>
</table>
• Salmonella evolution during ripening process

Benefit of cold pre-drying to manage pathogen germ

* No statistical differences between Cold drying and Control during the whole process and storage period
* Statistical difference between Control and E1 Norm at day 6 and day 9
Dry fermented sausages

Conclusions snacks of fuet industrial scale

- More than 70% reduction in saturated fatty acids (SFA) and more than 35% in sodium could be achieved

- Sensorial attributes are very close to control on every criteria. Characteristic taste of snacks of fuet is achieved

- With the pre-dried process at low temperature we have efficient microbial results because the pH is lower than control

- Yield of “reduced product” at industrial scale was a little bit lower than control, however it could be concluded that reduced products at industrial scale are affordable
Dry fermented sausages

New products in the market developed in TeRiFiQ project
WP2

• Conclusions:
  
  – Great reduction in salt and fat for new sausage products.
  
  – Mission accomplished!