

THREE PORTUGUESE COUNTRY-STYLE SAUSAGES

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SUMMARY

The use for human food of all swine edible portions from industrial slaughter, is an important task due to the low commercial value of some of them, such as soft fats, intestines, heads and blood.

Traditional portuguese sausages of high nutritive and gastronomic value is a correct way to improve these low-priced products.

We have developed for use in meat plants, the technology of three traditional portuguese sausages: "Cabeça de xara" (Swine Head Cheese), "Morcela de arroz" (Blood and Rice Sausage) and "Alheira" (Garlic Sausage).

The products have been submitted to sensorial, microbiological and chemical quality control. They have revealed a good stability under refrigeration, medium shelf-life, high nutritive and hygienic value.

INTRODUCTION

Traditional portuguese sausage industry uses to improve all edible swine products from muscular tissues and fats to by-products. The different economical, social, cultural and religious characteristics of the Country, including those related with differences among communities, determined a rich variety of sausage products employing meats and by-products from different animal species.

We developed for use in meat plants the technology of three traditional portuguese sausages: "Cabeça de Xara" (Swine Head Cheese), "Morcela de Arroz" (Blood and Rice Sausage) and "Alheira" (Garlic Sausage), usually made by workmanship ways in different areas of the country.

Our aim was to produce industrial sausage products employing low-value raw materials and simple technological processes.

For "Cabeça de Xara" (Swine Head Cheese), we used all the soft and cartilaginous tissues from water boiled swine heads mixed with part of the spiced broth.

For "Morcela de Arroz" (Blood and rice Sausage), we used bloody meat trimmings, epiploon and mesenteric fat, fresh blood and rice, seasoned with coriander and cumin.

For "Alheira" (Garlic Sausage) we employed lard, soft tissues from swine heads, poultry, rabbit and other lean meats, cooked in a spiced broth which are mixed with wheat bread.

MATERIALS AND METHODS

A - "CABEÇA DE XARA" (SWINE HEAD CHEESE)

Meats (parts)	
Cooked head meats	83,3
Derived cooking broth.....	16,7
Spices (%)	
Salt	2
Vinegar	2,5
Onion	2
Coriander	2
Pepper	0,2

Splited swine heads, tongue-less, are boiled for easy boning, one hour. The whole soft tissues are removed, minced in a grinder with a disk of 8 mm diameter, and transferred to a blade mixer. The cooking broth spiced with onion, coriander and pepper coarsely ground, salt and vinegar added, is mixed with the minced meats, to obtain an homogeneous paste.

The paste is filled into plastic PVC-PVDC casings 50 mm diameter and 150 mm length, clipped under vacuum or stuffed in aluminium or inox pressing-moulds into prismatic blocks 250x110x75 mm.

Final heat treatment is conducted in a water bath at 80°C for 50 minutes, to the product in plastic casing, and for 75 minutes to the moulded product, followed by quick cooling in fresh water and refrigeration at +4°C in the cold store.

The demoulded product is packed and vacuum clipped in a polyester bag, dipped in a water bath at 90°C for retraction of the plastic and stored at 4°C.

B. MORCELA DE ARROZ (BLOOD AND RICE SAUSAGE)

Raw materials (parts)	
Mesenteric fat, lymph glands enclosed	23,8
Bloody meat trimmings	23,8
Swine fresh blood	28,6
Micro wave pre-cooked rice	23,8
Seasoning (%)	
Salt	1,5
Minced fresh coriander leaves.....	4
Ground cumin	0,5
Minced fresh onion	2

The raw materials should be of the slaughter day and the whole technological process should also be achieved in the same day.

The chilled mesenteric fat and bloody meat trimmings are minced in a grinder with a disk of 8 mm diameter and transferred to a blade mixer onto which the rice and the seasoned blood are added. All the ingredients are well mixed to obtain an homogeneous paste which is loosely filled up in fresh swine large tripe (colon), tied with cotton file to obtain sausages averaging 250 mm length.

The heat treatment is performed in a water bath at 80°C for, at least 45 minutes (to get full blood cogulation),

followed by air cooling, vacuum package into polyethylene-polyamide bags and storage in the cold room at 4°C.

C. ALHEIRA (GARLIC SAUSAGE)

Ingredients (parts)

Cooked swine head meats	8,9
Cooked belly and jowl lard	11,8
Cooked poultry and other meats ..	17,6
Derived cooking broth	47
Wheat bread	14,7

Seasoning and additives (%)

Salt	1,5
Minced fresh parsley leaves	1,8
Ground dried pepper	0,8
Dried garlic	0,3
Ground dried chilli	0,06
Ground dried paprika	0,06
Potassium sorbate	0,3
Sodium propionate	0,3

The meats are boiling water cooked for one hour, hot boned and minced in a grinder with a disk of 12 mm diameter and transferred to a revolving blade mixer where they join the sliced bread previously boiled in the cooking broth and the seasoning and additives.

The homogeneous paste is tightly filled up and cotton tyed in natural cattle tripes (duodenum) to obtain horseshoe shaped sausages averaging 250 mm length.

The sausages are washed in warm water and transferred to an electric oven where they are dried out and pasteurized at 75°C (in the air) to get a 65°C core temperature in the paste for 30 minutes.

The "alheiras" are then transferred to a traditional Portuguese smoke house hanged over a fire of hard woods such as holm-oak, cork oak and olive tree where they are smoked for four hours, cooled in the air of a thermostatic room (10°C-90%RH) and stored at +5°C packed in polyethylene lined carton boxes.

QUALITY CONTROL

Final product were submitted to sensorial, microbiological and chemical control.

The organoleptic analysis were performed on the finished products and after 30 days storage.

Aspect, colour, flavour and texture were assessed according to (Conceição Martins, 1989)

Microbiological analysis included standard count of mesophylic total aerobes, D. group Streptocci, coliform and faecal coliform bacterias, sulfite reducing Clostridia spores, fungi, (moulds and yeasts) and researche of Salmonellae in a 25 g (13)

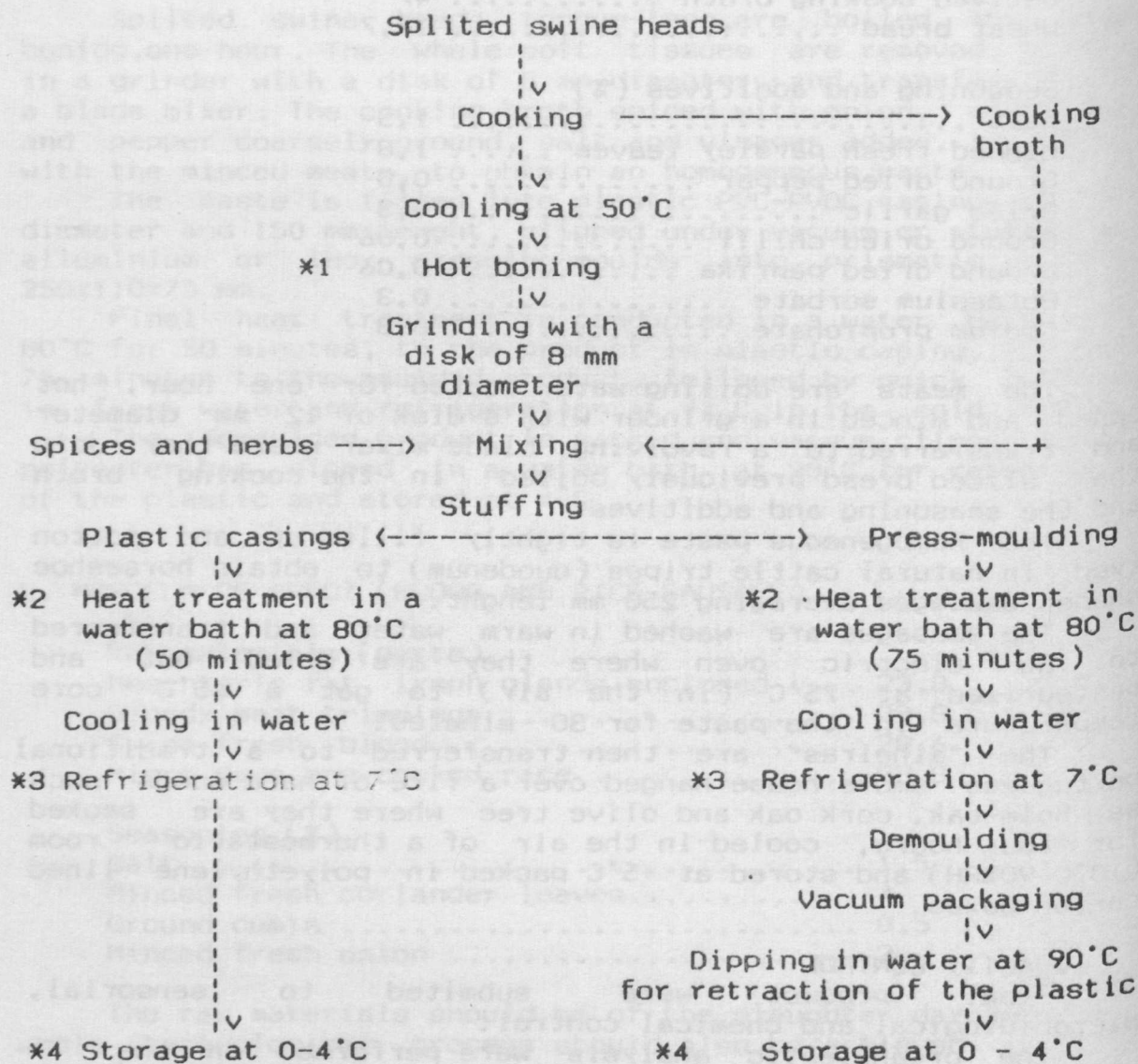
Chemical analysis included weight loss at 1050C crude protein, ether extract, total ash and carbohydrates (by

calculation)(1). Energy was calculated by the Atwater coefficients(6) (4 x protein and carbohydrates; 9 x ether extract)

QUALITY ASSURANCE

We present the flow-sheets of three products for stressing the Critical points (HACCP: Hazard Analysis Critical Control Points):

CABEÇA DE XARA (SWINE HEAD CHEESE)



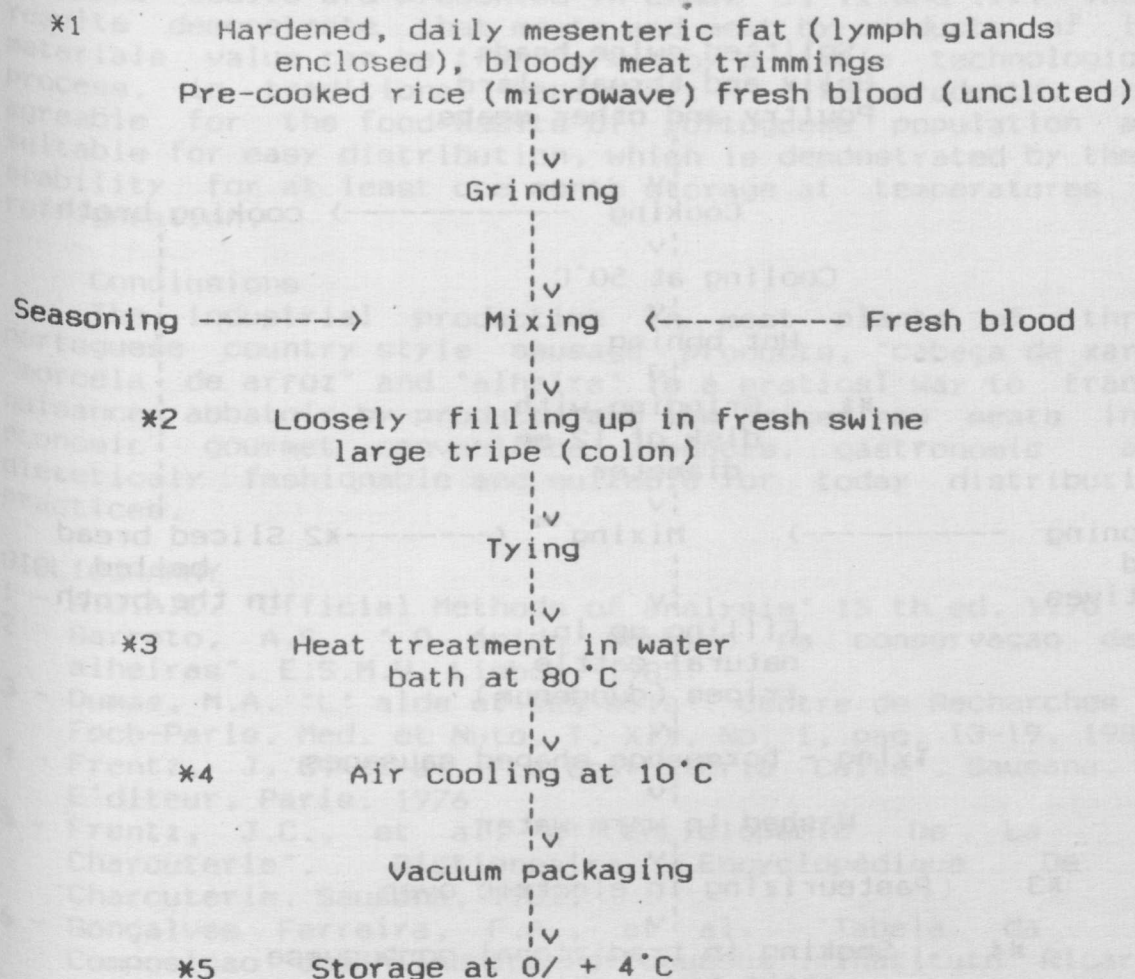
HACCP: time-temperature schedules

From 1 to 2 - Four hours

From 2 to 3 - Four hours

From 3 to 4 - Continuous in line

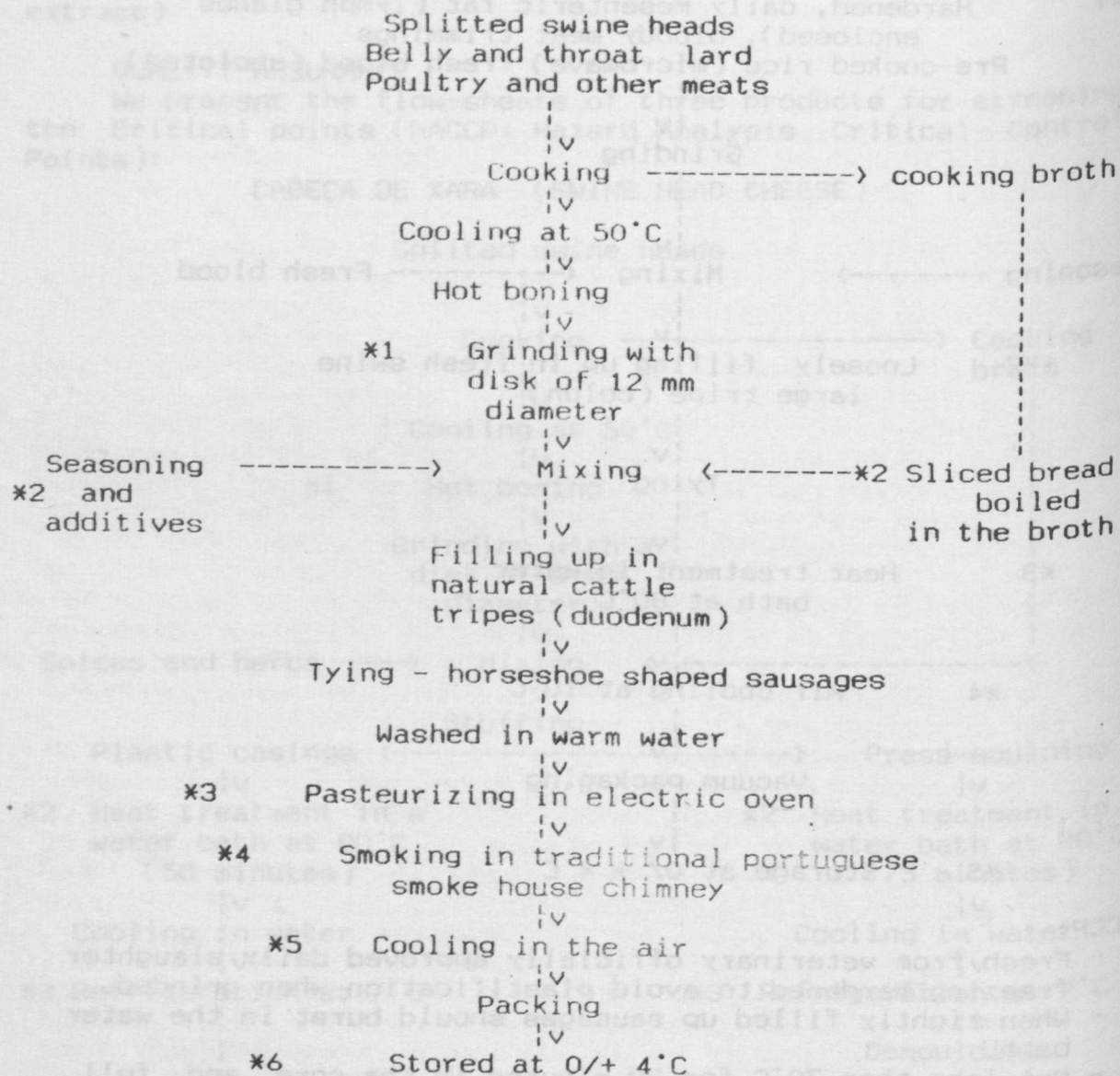
"MORCELA DE ARROZ" (BLOOD AND RICE SAUSAGE)



HACCP:

- *1 - Fresh from veterinary officially approved daily slaughter freezing hardened to avoid plastification when grinded.
- *2 - When tightly filled up sausages should burst in the water bath.
- *3 - Not less than 70°C for 30 minutes in the core and full blood cooking (test by needle puncture)
- *4 - No more than 4 hours elapsed over the end of *3
- *5 - From 4 to 5 - Continuous in line

"ALHEIRA" = GARLIC SAUSAGE



* HACCP

- *1 - 12 mm or more to produce identifiable meat and lard pieces.
- *2 - Bread must be boiled to kill yeast, moulds and non spore forming bacteria. Bread spore former bacteria are controlled by sorbate and propionate (2).
- *3 - From *1 to *3 not more than 4 hours elapsed
- *4 - Direct transfer to pre-heated chimney to avoid surface moistening which would impair honey-like smoke colour development on the sausages
- *5 - Direct transfer from *4, air temperature (10°C) and moisture (85-90% RH) must be carefully set up to prevent tripe shrinking or moistening.
- *6 - From 5 to 6 continuous in line. Not more than 6 hours from *4 to *6.

Results and discussion

The results are presented in annex I, II and III. These results demonstrate that meats and meat by-products of low materials value can be transformed by a simple technological process, in traditional handicraft - like products, very agreeable for the food habits of portuguese population and suitable for easy distribution, which is demonstrated by their stability for at least one month storage at temperatures of refrigeration.

Conclusions

The industrial production in meat plants of three portuguese country style sausage products, "cabeça de xara", "morcela de arroz" and "alheira" is a practical way to transform nuisance abattoir by-products and low priced raw meats into economic gourmet convenience products, gastronomic and dietetically fashionable and suitable for today distribution practices.

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Annex 1

SENSORIAL QUALITY CONTROL

A. Cabeça de xara (Swine Head Cheese) - After production

	Aspect	Colour	Flavour	Texture
1) Plastic cased	Cilindrical sausage of constant diameter, extremities clipped	Gray and light brown meat spots on a ivory matrix	Pleasant sui generis spiced cooked pork	Firme sliceable
2) Press-moulded vacuum packed	Block rounded surfaces edges and angles	decorated with parseley		

After 1 month storage 4°C unchanged

B. Morcela de arroz (Blood and Rice Sausage) - After production

Aspect	Colour	Flavour	Texture
Dark Gross Sausages	Brown chocolate With rice grains in a coarse granular matrix	Pleasant Sui generis aromatic cumin/coriander like	Firm sliceable

After 1 month storage 4°C unchanged

C. Alheira (Garlic Sausage) - After production

Aspect	Colour	Flavour	Texture
Bright Sausages	Honey-like yellow horse-shoe shaped sausages. Grumous paste cream coloured with small pieces of meat and lard	Pleasant smoked spiced garlic paste	Soft, not sliceable

After 1 month 4°C unchanged

Annex II - MICROBIOLOGICAL ANALYSIS

A. Cabeça de xara (Swine Head Cheese)

	After production	After 1 month storage at 4°C
Total plate count (CFU/g)	33×10^4	77×10^4
D-group Streptococci (CFU/g)	$< 10^3$	27×10^3
Coliformes (MPN/g)	> 1 < 10	> 1 < 10
Faecal coliformes (MPN/g)	< 1	< 1
Moulds and yeast (CFU/g)	< 10	< 10
Sulfite reducing Clostridia spores (CFU/g)	> 1 < 10	> 1 < 10
Salmonellae in 25°C	Neg	Neg

B. Morcela de arroz (Blood and rice sausage)

	After production	After 1 month storage 4°C
Total plate count (CFU/g)	86×10^4	13×10^5
D-group Streptococci (CFU/g)	$< 10^3$	$< 10^3$
Coliformes (MPN/g)	> 10 $< 10^2$	> 10 $< 10^2$
Faecal coliformes (MPN/g)	< 10	< 10
Moulds and yeasts (CFU/g)	24×10	10^2
Sulfite reducing Clostridia spores (CFU/g)	> 1 < 10	> 1 < 10
Salmonellae in 25g	Neg	Neg

C. Alheiras (Garlic sausage)

	After production	After 1 month storage 4°C
Total plate count (CFU/g)	20 x 10 ⁵	37 x 10 ⁵
D-group Streptococci (CFU/g)	< 10 ³	40 x 10 ²
Coliformes (MPN/g)	< 10 ²	< 10 ²
Faecal coliformes (MPN/g)	< 10	< 10
Moulds and yeasts (CFU/g)	10 ³	37 x 10 ³
Sulfite reducing Clostridia spores (CFU/g)	> 10 < 100	> 10 < 100
Salmonellae in 25 g	Neg	Neg

Annex III - Chemical analysis

A. Cabeça de xara (Swine Heads Cheese)

	After production	After 1 month storage 4°C
% weight loss(105°C)	54,0	55,6
Crude Protein (%)	12,00	12,80
Ether Extract (%)	30,0	27,8
Total ash (%)	2,50	2,20
Carbohydrates (%)	1,50	1,6
Metabolizable energy kJ/kg	13561	12883
Metabolizable energy kcal/kg	3240	3078

B. Morcela de arroz (Blood and Rice Sausage)

	After production	After 1 month storage 4°C
% weight loss(105°C)	47,1	46,7
Crude Protein (%)	12,00	12,50
Ether Extract (%)	28,2	29,0
Total ash (%)	2,10	2,00
Carbohydrates (%)	10,6	9,8
Metabolizable energy		
kJ/kg	14406	14657
kcal/kg	3442	3502

C. Alheiras (Garlic sausage)

	After production	After 1 month storage 4°C
% weight loss(105°C)	51,0	50,0
Crude Protein (%)	11,90	12,00
Ether Extract (%)	18,0	19,5
Total ash (%)	2,10	2,00
Carbohydrates (%)	17,0	16,5
Metabolizable energy		
kJ/kg	11685	12117
kcal/kg	2792	2895