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Food Engineering Department

INTERNATIONAL FOOD CONGRESS

Novel Approaches in Food Industry

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PREFACE

It is our pleasure to introduce you **The International Food Congress** entitled **"Novel Approaches in Food Industry"** which will be held in Çeşme, Izmir, TURKEY. The congress will take place on 26-29 May, 2011 and include a variety of hot topics such as novel food products and technologies, thermal and non-thermal food processing technologies, applications of nanotechnology in food processing, innovations in food science and technology. This congress will highlight the most important areas of recent Research & Development in Food Science and Technology as well as explore relevant and interesting topics for the future. The congress will also provide accurate and updated scientific information and trends for the discipline of food science and technology. 400 leading scientists from all over 40 countries will contribute to the congress as oral or poster presentations.

This congress will provide a forum for the exchange of ideas and authoritative views by leading scientists, as well as business leaders and investors in the food industry. **More than 32 leading food industry companies became sponsor or supporting organization to our congress.** Outstanding keynote speakers and well-known leading scientists and experts from around the world will be sharing their knowledge with us. Company executives, as well as speakers from universities, research centers and governmental institutions will discuss scientific and technical developments in detail.

We would like to thank all contributors including authors of oral and poster presentations and our sponsors for contributing to the success of this congress.

On Behalf of the Executive Committee

Prof. Dr. Sebnem TAVMAN

AFTERNOON SESSION (14.00-18:30)
FOOD CHEMISTRY AND QUALITY

Evaluation of structural and functional conditions of regional Portuguese kitchens, their legal framing and influence on the quality of the final product

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Abstract

The region of the Northeast of Portugal is known for the production of traditional meat products. *Alheira* is one of these products which is usually prepared in "Regional kitchens". These are small units that cannot produce more than 2000 kg of dry sausages per year. Due to their regional importance, it was necessary to judicially protect the production of this kind of products. In fact, individual producers of regional kitchens have to follow European regulations, as well as a Portuguese normative, namely, the Law-Decree nº 209/2008 that approves the "State of Practice of the Industrial Activity" (REAI).

In order to obtain knowledge regarding the effectiveness of this normative, in the present work the structural and functional conditions of three regional Portuguese kitchens were evaluated and the way these points are considered in REAI is discussed. Moreover, the quality of the final product was also determined.

The structural and functional conditions of the studied regional kitchens were adequate. Machines and local areas were appropriate and no crossing on production lines was observed. In regards to workers, their number was quite low (≤ 3), they were older than 45 and had c. Most of these points are considered in REAI under the topic named "Business Plan". Finally, it was verified that *alheiras* did not represent any danger to public health, since no food borne microorganisms were detected.

Introduction

Trás-os-Montes is a Portuguese region known for the production of traditional, smoked, naturally-fermented meat products. This production is still made in a traditional form and these products being highly appreciated. However, it was necessary to judicially protect this kind of products. *Alheira* is one of the most important, being frequently described as a traditional, smoked, naturally-fermented meat sausage, prepared from pork meat or its mixture with poultry, bread and olive oil, spiced with salt, garlic and paprika. Generally, this kind of products is produced in "Regional kitchens" that include small scale producers. These small units cannot produce more than 2000 kg of meat yearly.

Nowadays these individual producers have to fulfill European regulations, such as EC Regulation n.º 852/2004, EC Regulation n.º 853/2004 and EC Regulation n.º 2074/2005, as well as Portuguese normatives, such as the Normative-Dispatch n.º 38/2008 and Law-Decree nº 209/2008 which approves the "State of Practice of the Industrial Activity", called REAI. The main aim of this Law-Decree is to prevent the risks associated with the exploration of these industrial establishments, in order to guarantee public health, security of persons and their belongings, hygiene and safety of the work places and quality of the environment, in addition to other points.

The present work intended to evaluate the structural and functional conditions of three "Regional kitchens" and discuss how these points are included in REAI. Moreover, the quality of the final product was also determined.

Materials and Methods

A survey was conducted in three "Regional kitchens" located in the Northeast of Portugal. In order to evaluate how these kitchens were considered in REAI, first a check-list was applied concerning the following main topics: (i) Products produced (type and quantity); (ii) Months of work; (iii) Number of workers and their qualifications; (iii) The existence of a rastreability system; (iv) Machines and equipment available; (v) Type of water used; (vi) Types of energy; (vii) Main sources of noise and vibrations; (viii) Existence of a Plague Control Program; (ix) Types of firewood; (x) Temperature monitoring; (xi) Description of the structural characteristics, namely in regards to the hygiene capacity (washing and disinfection); (xii) Characteristics of the materials and equipment; and (xiii) Description of the social character of the installations.

In addition, the microbiological characterization of *alheiras* subjected to a dry period of five days was also performed in the three kitchens. This period of time was chosen because producers considered this interval to be enough to perform proper drying/smoking and to obtain products ready to be consumed. The aim of the microbiological analysis was to evaluate the type and number of the microorganisms present in order to evaluate the quality and safety of the product. In order to do so, the following microbiological counts were performed: (i) Deteriorative flora, namely total mesophiles, molds and yeasts; (ii) Microorganisms indicative of deficient microbiological quality and fecal contamination – total coliforms and *Escherichia coli*; and (iii) Microorganisms responsible for foodborne diseases, such as *Listeria monocytogenes*, *Salmonella* spp. and *Staphylococcus* positive coagulase, namely *S. aureus*.

These microorganisms were detected and/or quantified by the following methods: (A) Mesophiles: ISO 4833:2003 standard; (B) Molds/Yeasts: ISO 7954:1998 standard; (C) *Staphylococcus* positive coagulase: NP 4400-1:2002 standard; (D) *Salmonell*a spp.:1-2 Test® (Official method of AOAC 989.13); (E) *Listeria monocytogenes*: Imunoprecipitation method (VIP®) (Official method of AOAC 997.03); and (F) Total coliforms and *Escherichia coli*: SimPlate® method (Official method of AOAC 2005.03).

Results and Discussion

In general terms, the structural and functional conditions of the studied regional kitchens were quite satisfactory. In the following sections, the results are presented in more detail and are also discussed at the same time in relations to the REAI.

Localization – Utilization business license for industrial usage

All the kitchens were located in rural areas and had business licenses. This point is included in REAI as a guarantee that the activities are correctly legalized.

Business plan

The business plan is included in REAI and refers to the following aspects:

Description of the industrial activity: The code for the Portuguese Classification of the Economical Activities (CAE) attributed to this kind of establishments is 10130, under the designation: "Production of meat products";

Final products: The same products were produced in all kitchens, namely: *alheira* (produced in the highest quantity), *butelo* (fermented sausage that includes bones), sour smoked sausage, smoked pork blood sausage (sometimes enriched with almonds and walnuts), *linguiça* (a thinner type of fermented sausage) and sausage of pickled pork (larger than the previous). The first four products must undergo a final thermal treatment before consumption. On the other hand, the last two can be eaten without additional treatment.

Machines and Equipment: All the kitchens were quite well equipped (Table 1) with an adequate number of machines and equipment for the production of safe products.

Table 1 – Machines and equipment in the regional kitchens.

	Kitchen		
	A	B	C
Machine to fill the sausages	1	1	1
Vacuum machine	1	1	1
Mincing machine	1	0	1
Refrigeration chamber	1	1	1
Oven	1	1	1
Filling table	1	1	0
Weighing-machine	1	1	1
Cutting table	0	1	0

Food workers: The food workers had the following qualifications: Kitchen A – a 68 year old woman; Kitchen B: Two to three 45 to 50 year old women; Kitchen C: a 55 year old woman and a 56 year old man. All of the workers had finished primary school. These results indicate that the number of workers in this kind of establishments was quite low (≤ 3), that they were older than 45 and had basic education.

Social accommodations: These include cloak-rooms, bathrooms, wash-basins, shower-rooms and first aid equipment. It was stated that in the three kitchens, the social accommodations were located at the kitchen entrance with easy and proper access, without direct communication with the production areas. These structural characteristics facilited the cleanliness of the three establishments. The sanitary rooms had cold and hot water and were equipped with hand drying hygienic methods, namely small paper towels. Waste bins with foot-lever were also available. In general terms, the social accommodations seemed to be quite adequate. This point in REAI is of great importance. It allows us to know the real conditions which if not adequate, can place the hygiene and food safety of the products in danger. Nevertheless, no first aid equipment was found in any of the studied kitchens. This point needs correction because it is an activity that involves some danger of cutting, burning, etc. Band-aids, gloves, disinfection solutions, in addition to others, must be available.

Water used: In all kitchens the water was from the public network. In spite of this, the treatment systems are at the expense of the municipalities. The flows were not given by the kitchen's owners.

Energy used and produced: The only energy used in the establishments was electric; however the power consumptions were not given. No other form of energy was produced by the establishment.

Noise and residues: The only residues produced are those related with the washing and disinfection activities of the utensils, equipment and infra-structures. Due to the low quantities involved, these residues were directly discharged to the public sanitation system. Also due to the small quantities of residues produced, namely, kitchen-scraps, they were treated as domestic organic rubbish.

Attribution of the veterinary control number

This point in REAI includes the following aspects:

General drawing of the establishment + Production line (functional areas and flows included): Due to the low number of workers and to the small productions involved, the dimensions of the establishments were adequate to prepare the fermented sausages under hygienic conditions. The locations were designed to prevent the occurrence of contamination. Raw-materials are stored in refrigerated chambers (Table 1) and final products are dried/stored in a separate room. No crossing in the circuits was observed. A general drawing of one of the kitchens studied is represented in Figure 1. The other two were identical.

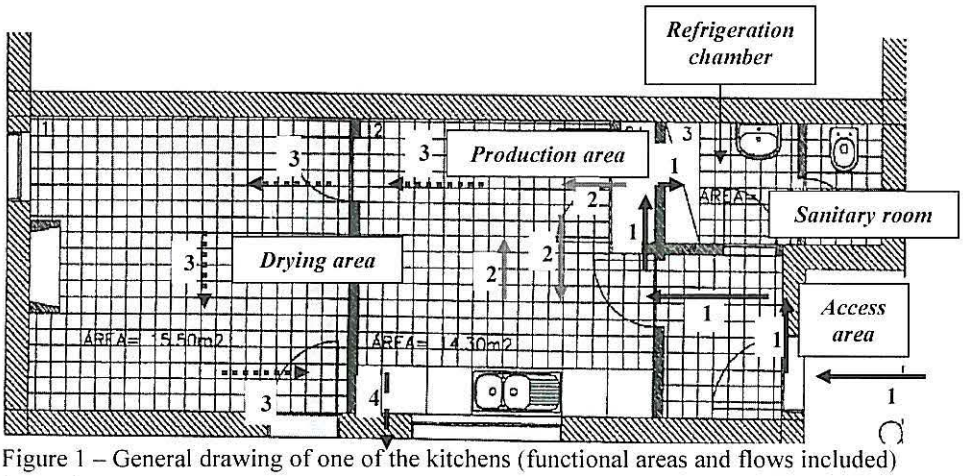

Figure 1 – General drawing of one of the kitchens (functional areas and flows included)

Legend:

	Circuits
1	Reception and storing of raw-materials
2	Processing
3	Drying/Storing
4	Expedition

Description of the structural conditions of the establishment: Generally, the existing structural conditions in the kitchens followed points 1 and 2 of Chapter I of Annex B of the Law-Decree n.º 342/98. Most of the time, the materials used in the construction were easy to clean and disinfect. Only in one kitchen, the doors and windows were made of wood which is an absorbent material and is not easy to clean, allowing for the growth of microorganisms. Moreover, in this kitchen there was no insect trap on the windows, permitting for the presence of plagues in the production area. These might be a contamination source. Nevertheless, during the sausage production, the windows were always closed.

In the kitchens, there was no hand-washing basin with non-manual driving action. Nevertheless, unclean hands are generally linked to the occurrence of crossed contaminations.

Flowchart for each production line: Each kitchen follows a recipe. After receiving the raw-materials that are generally stored in refrigerated chambers, the sausage production starts rapidly. The meat is boiled in salted water spiced with malaguetta in iron pots. The cooking ends when the meat separates easily from the bone. After this, the meat is shredded manually. The pigskin can be chopped in a mincing machine, as used in kitchens A and C (Table 1). This step is critical because cross contamination can occur due to food workers and equipment. The ingredients are then mixed. The boiled water is strained and used to soften slices of bread. To this mixture, the chopped meats and garlic, paprika and olive oil are added.

The filling up is made in dehydrated hog's casings, previously washed in water spiced with lemon, laurel leaves and brandy. The three kitchens had machines to fill the sausages (Table 1) which reduces the risk of contamination by the handlers.

During the smoking phase, *alheiras* are suspended on sticks near the fireplace. The objective of this step is to smoke/dry the sausages for approximately one week. After this step, the *alheiras* are ready to be eaten. The majority are immediately sold, while the other portion is vacuum packed.
The procedure followed by kitchens B and C was the same, where pork meat and chicken were used as raw-materials. In kitchen A pork meat was only used and olive oil was not added to the mixture because the person responsible considers that the pork meat had enough fat already. These differences in the formulation/seasoning are responsible for the high variability found among *alheiras*, representing in part the cultural diversity found in the region.

Existence of a plague control program
This point is not considered in REAI. Some kitchens had insect traps near the main entrances and insect nets on the windows. Nevertheless, none of the three kitchens had implemented a plague control program. This is due to its high cost. However, the inexistence of these programs may cause serious problems in the quality and safety of the products as plagues are sources of microorganisms, some of them pathogenic. Moreover, many times the kitchens are located in rural areas, where animals are frequently found. So, it is very important that these plagues do not have any access to the interior of these kitchens.

Microbiological quality of the final product
The microbiological quality of the *alheiras* produced in the three kitchens is represented in Table 2.

Table 2 – Average values of log cfu/g (± standard deviation) of mesophiles, molds and yeasts, coliforms and *E. coli* determined in the *alheiras* of the three kitchens.

Kitchen	log cfu/g			
	Mesophiles	**Molds and yeasts**	**Coliforms**	***E. coli***
A	4.8±3.1	7.6±1.4	2.1±1.5	1.1±0.2
B	7.0±1.1	8.4±1.0	1.1±0.1	<1.0
C	8.5±0.6	8.1±0.3	2.9±0.5	<1.0

High values of mesophiles and molds/yeasts were encountered. Similar results were reported by Esteves (2005) and Esteves *et al.* (2006) that determined values equal to 8.28 and 8 log cfu/g, respectively. These results are indicative of deficient microbiological quality of the products.

In relation to coliforms, the highest value was determined in kitchen C. *E. coli* was only detected in *alheiras* of kitchen A. This situation is preoccupying when *alheira* is incorrectly cooked, as the presence of this microorganism is considered a microbial indicator of fecal contamination. However, Ferreira *et al.* (2006) consider unsatisfactory values higher than 2 log cfu/g for *E. coli*. Under this criterion, all *alheiras* analyzed were satisfactory.

No *Salmonella* and *Listeria* were detected. Similar results were reported by Ferreira *et al.* (2007) for *alheiras* produced by small artisanal producers. In terms of *Staphylococcus* positive coagulase, no positive results were determined.

Conclusions/Recommendations
In general terms, the present study allowed us to verify that the Portuguese regional kitchens fulfill the obligatory requisites for the preparation of sausages in a hygienic and safe way. The structural characteristics, functional areas, circuits, as well as the social establishments, are conceived in a way as not to cause any constraint to the operations.

Taking into account the microbiological characteristics, *alheiras* did not represent any danger to public health, even when high counts of mesophiles were found that can decrease the quality of the product. No foodborne microorganisms, such as *Salmonella*, *Listeria monocytogenes* and *S. aureus*, were detected.

In conclusion, this study also allowed us to state that the points referred in REAI assure the minimal conditions for the production of this kind of products. Taking into account the secular experience of this kind of production in addition to the empirical knowledge of the workers, the products produced are of high quality. Therefore, this production must be encouraged and protected, although there are some aspects that need to be improved.

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