Quality and Safety Assessment of Meat Products Obtained by Traditional Romanian Recipes

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Abstract

Meat products obtained following traditional recipes are considered healthy foods, with superior sensory characteristics, being highly appreciated by consumers. This study aimed to evaluate the quality and safety of 18 meat products obtained by traditional receipts, including raw/smoked pork sausages (*n*=3), loin (*n*=1), bacon (*n*=2), kaizer (*n*=1), ham (*n*=1), spareribs (*n*=1), pork pastrami (*n*=1), and sausages prepared from edible meat offal of pork (*n*=8). All samples were bacteriologically examined (*Salmonella*, *L. monocytogenes* and *E. coli*). Also, moisture, fat, total protein, salt and nitrite contents were quantified. All products were *Salmonella* and *L. monocytogenes* free. *E. coli* was recovered in two samples (11.1%), a smoked pork sausage and a sausage prepared from edible meat offal of pork, at levels between 1.5 log and 3.25 log cfu/g. Moisture ranged from 17.21 to 67.46%, fat 17.37–62.18%, protein 8.13–23.18%, sodium chloride 1.50–6.39%, and nitrites <10–35 ppm, respectively. In two samples (11.1%) of smoked meat products the salt content exceeded the maximum limits allowed by law. These results have shown that meat products obtained by traditional recipes are nutritive and safety. However, some varieties of meat products with high salt concentrations should be avoided by persons with dietary salt restriction.

Keywords: meat products, quality, safety, traditional

1. Introduction

Meat and meat products are commonly consumed foods, important sources of protein, vitamins and minerals. However, their consumption contributes to the intake of fat, cholesterol, salt, etc. [1]. Traditional meat products, but also the products prepared according to traditional recipes are considered healthy foods with superior sensory characteristics, being highly appreciated by consumers. There is a great variety of meat products, different size, shape, colour and taste characteristics.

In recent years, in Romania, but also in other European countries where they live Romanian is obvious the orientation towards traditional Romanian products. This orientation may be attributed not only satisfy of some special culinary requests but, more important, due to the perception of these categories of products as an important component of the culture and identity of the Romanian nation [2].

Meat and fat are the principal raw materials used for meat products. Other edible parts of the slaughtered animal used in processing are the internal organs: tongue, heart, liver, kidneys and other slaughter by-products: blood, meat from head etc. [3].

There is a great variability in the quality of traditional products, variability due to fluctuations in the quality of raw materials: meat, fat, edible offal, skins and blood, the recipes used and the processes for obtaining them. Even though these types of products are produced in small quantities and, consequently, are consumed by a smaller number of consumers, they are controlled by the

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responsible authorities with the same exigencies, criteria and legislation, as for the products obtained through industrial methods.
The objectives of this study were to evaluate the quality and safety of some categories of meat products, obtained using traditional recipes.

2. Materials and methods

Sample collection
A total of 18 meat products, which was divided into two categories, products prepared from meat and fat (n=10), and sausages prepared from edible meat offal of pork (n=8), were purchased during the winter season. These products were sold from small producers in three areas of Timişoara (*C; B.C.; P.V*), either in agro-food markets or in the temporary food stands. Each sample (250-300 g) was placed in a sterile bag and identified. Then, the samples were placed in refrigerated box and transported to the laboratory.
Microbiological analysis
Salmonella detection. As a first step, 25 g of each sample was placed into the stomacher bag [4]. An appropriate volume of buffered peptone water (225 mL) was added and homogenized in Stomacher for one minute. Selective enrichment was done by transferring of the BPW suspension to *Rappaport-Vassiliadis* (RVS) broth and *Muller-Kauffmann* tetrathionate with novobiocin (MKTTn). The RVS suspension was incubated at 41.5°C, 24 h and MkTTn broth, at 37°C for 24 h. Isolation and identification were performed by plating on xylose lysine desoxycholate (XLD) agar and Rambach agar, which were incubated at 37° C, 24 h. Typical colonies were selected and identified by biochemical and serological tests [5].
Detection of *Listeria monocytogenes* was done using the following steps: the primary enrichment in a selective enrichment broth (semi Fraser), incubation at 30°C for 24 h; secondary enrichment in a selective enrichment broth (Fraser), incubation at 37°C for 48 h; isolation by plating on ALOA and PALCAM selective agar. Typical colonies were selected and identified by morphological, biochemical or molecular tests [6].
To determine *Escherichia coli* number, all the samples were serially diluted in peptone water, each dilution was inoculated on the Tryptone Bile X-glucuronide agar (TBX). The plates were incubated at 44° C, for 24- 48 h, and the colonies counted [7].

Chemical analysis
The moisture content of the meat products was determined through drying method at 103 ± 2^0 C, until the samples attained the constant weight. The fat content was determined according to the *Soxhlet* extraction method. Total protein (nitrogen content) was determined by the *Kjeldahl* method. The salt content was determinate using *Mohr* method and he content of nitrites was detected spectrophotometrically after reaction with *Griess* reagent [8].

3. Results and discussion

Salmonella and *Listeria monocytogenes* were not isolated from any of the tested samples. In the heat-treated meat products, these pathogens are usually inactivated. Thus, the research conducted by Jordas [9] in Ireland over a three years period analyzing more than 25 000 cooked meat samples the prevalence of Salmonella-positive samples was below 0.1%. Lower prevalence in this meat products is due to heat treatment and thermal inactivation of *Salmonella*.
In a review article, Baer et al. [10] highlighted the importance of the types of retail in *Salmonella* occurrence. Thus, it was found that the butcher shops had a higher prevalence of *Salmonella* in comparison to the supermarkets. Differences in hygiene, the probability of cross-contamination, and handling of meat products vary between types of retail stores and have an important influence on *Salmonella* prevalence. In our study, although the meats products were commercialized in temporary food stands or in agro-food markets, the absence of *Salmonella* and *L. monocytogenes* in all tested samples may be due to short time period until the sale of meat products, but also as a result to the low temperatures of storage, factors that affect result of the low possibilities of bacterial multiplication and cross-contamination.
E. coli was recovered in two samples (11.1%), a smoked sausages and a sausage prepared from edible offal of pork (*Caltaboş B.C*). The *E. coli* counts ranged from 30 cfu/g (1.5 log) to 1,760 cfu/g (3.25 log). According to Commission Regulation (EC) No. 1441/2007 which specifies microbiological criteria for meat products *E. coli* is used as process hygiene criteria. Levels exceeding 5000 cfu/g are unsatisfactory and indicate poor hygienic conditions or inadequate

heat treatment. In the current study only one sample tested was in the acceptable range (500-5,000 cfu/g), all else being classified as satisfactory.

Using good quality raw materials, properly heat treatment (as temperature and time), effective sanitation of the equipment and processing environment are critical steps in avoid contamination of RTE meats [11].

The analysis of the major components of the meat products (moisture content, total protein, and fat), have been obtained the results shown in Table 1 and Table 2. The results obtained are in compliance with national requirements for meat products regarding the contents of nutritional components, water and compounds [12].

The chemical composition of meat products obtain using traditional recipes are related to raw material and specific technology applied. Different meat products were characterized by a different content of the main components. Particularly technology applied by individual producers reveals some variations in water, protein and fat content. For the moisture content of meat products a large variation, between 17.24 and 62% were observed. The highest moisture content in *Bacon C* (62.08%) and the lowest content of water in *Pork pastrami C* were noted (Table 1). The protein content of raw products ranged from 16.80% (*Bacon B.C.*) to 23.18% (*Bacon C*). Even if they belong to the same category, processing method and the quality of raw material determined this variation of protein content.

Table 1. The proportion of the main components of meat products

Category/ Type	**Water (%)**	**Protein (%)**	**Fat (%)**
Raw / Smoked meat products			
Raw pork sausages C	50.65	18.93	30.27
Loin B.C.	56.38	21.25	21.15
Smoked sausages B.C.	42.95	18.02	36.67
Smoked sausages P.V.	46.53	20.26	30.61
Bacon C	62.08	23.18	10.58
Bacon B.C.	29.28	16.80	47.28
Smoked and pasteurized products			
Ham B.C.	43.25	18.14	31.78
Kaiser B.C.	43.50	21.32	31.75
Salted and dried products			
Spareribs C	29.09	19.05	49.31
Pork pastrami C	17.21	16.60	62.18

Considering the fact that the content of protein directly influenced the nutritional value of the products obtained is important to highlight this aspect. For the other two categories of meat products variation the limit in terms of protein, contents did not exceed 3%. Fat is the most variable compound of meat products obtained by Romanian traditional methods. It particularly affects products smell, taste end shelf life. There have been variations in fat contents between 10.58% to 47% for smoked meat products and the variations reached up to 62% fat contents for dried salted products.

The proportion of the main components of sausages prepared from meat and edible offal of pork are related in Table 2. The moisture content of the products had registered variations between 53.81% and 67.48%, noting variations of 14% for products in the same type (*Caltaboș*).

Also, it must be emphasized that protein content had different values within the same type of product. Thus, there was variation 8.13% to 15.46% for *Caltaboș* or from 12.93% to 19.24% for blood sausages (*Sângerete*).

The results obtained in this research are similar to those published in a study of Romanian traditional products containing meat and edible offal of pork edible offal of pork [14].

Table 2. The proportion of the main components of sausages prepared from meat and edible offal of pork

Types	**Water** (%)	**Protein** (%)	**Fat** (%)
Caltaboş[1] *P.V.*	53.81	15.46	28.83
Caltaboş [1] *B.C.*	60.22	14.13	23.03
Caltaboş [1] *C*	67.46	8.13	22.31
Sângerete[2] *B.C.*	60.41	12.93	23.61
Sângerete [2] *C*	55.34	19.24	22.81
Leber[3]	64.84	9.22	23.15
Tobă[4] *B.C.*	67.32	13.53	17.37
Tobă[4] *C*	66.42	13.28	17.55

Note: [1]*Caltaboş* = an emulsified sausage based on liver with consistency from fine (*pâté*) to coarse; [2]*Sângerete* (black pudding) = blood sausages - an emulsified sausage obtained from a mixture of pig's blood with fat and meat, breadcrumbs or other grains, and spices; [3] *Leber* = liver sausage; [4] *Tobă* = (head cheese) – based on pig's feet, ears, and meat from the head suspended in aspic and stuffed in pig's stomach [13]

Nitrates are a group of additives utilized as a preservative and colour fixation in a meat curing preparation for industrial technology, due to the lack of oxygen, the development of rancidity is retarded. Generally, within 20 days of cold storage, they drop in concentration further to a third of the concentration after heating [15].

Even if the use of traditional methods for obtaining meat products presumably not involve the use of additives in salting mixture (e.g. nitrates), to our surprise, in half of the products analyzed these additives were present. None of the meat products had the residual nitrite value exceeded the maximum limit of the national legislation [16].

The salt contents in some cases it was in direct relation to moisture content.

Generally, the salt contents were around 2.3-3% for the majority of the products (Table 3 and Table 4).

Table 3. The proportion of the added components in meat products

Category/ Type	**Nitrites** (ppm)	**NaCl (%)**
Raw / Smoked meat products		
Raw pork sausages C	< 10	2.29
Loin B.C.	< 10	0.66
Smoked sausages B.C.	< 10	1.86
Smoked sausages P.V.	< 10	2.53
Bacon C	35	4.16
Bacon B.C.	<10	6.27
Smoked and pasteurized products		
Ham B.C.	22	6.39
Kaiser B.C.	25	3.13
Salted and dried products		
Spareribs C	< 10	2.53
Pork pastrami C	19	3.85

Table 4. The proportion the added components in sausages prepared from meat and edible offal of pork

Types	**Nitrites (ppm)**	**NaCl (%)**
Caltaboş[1] *P.V.*	<10	1.62
Caltaboş [1] *B.C.*	21	2.71
Caltaboş [1] *C*	21	1.92
Sângerete[2] *B.C.*	20	2.47
Sângerete [2] *C*	30	1.50
Leber[3]	<10	2.35
Tobă[4] *B.C.*	24	1.68
Tobă[4] *C*	28	2.47

In two samples (11.1%) of meat products the salt content exceeded the maximum limits allowed by law (*Bacon B.C.* and *Ham B.C.*).

4. Conclusions

• Meat products obtained using traditional recipes and commercialized as direct sales in agro-food markets or in the temporary food stands in Timişoara have no microbiological risks for consumers.
• Both meat products and sausages prepared from meat and edible offal of pork are nutritive and are in compliance with specific recipes.
• The variability of the main components of meat products in the same type reflects the variability of quality of raw materials used.
• In some types of smoked meat products, the salt concentration exceeded the maximum limits allowed by law. These products should be avoided by persons with dietary salt restriction.

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