

## Dynamic aspects concerning meat products safety

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### Abstract

The purpose of our study has been to evaluate sensorial, chemical and microbiological qualities of meat derivatives from different production units of Dolj County. For four years we have analysed 458 samples of meat products (five assortments: kind of mortadella, frankfurters, (summer) salami, smoked sausages and minced meat for *mititei*). A number of 194 samples (42.35%) were out-of-standards, most of them (94.85%) because of chemical parameters. Most frequently we found the exceeding of the maximum admissible values for collagen/proteins ratio (60.1%) and for lipids (51.1%).

**Key words:** food safety, meat products, chemical analyses, collagen/proteins ratio

### Résumé

L'objectif de notre étude a été d'évaluer les particularités sensorielles, chimiques et microbiologiques des charcuteries préparées dans des entreprises du Département de Dolj. Pendant quatre années nous avons récolté 458 échantillons de charcuteries (cinq assortiments: sorte de mortadelle, saucisses de Frankfurt, salami (d'été), saucissons fumés, viande hachée pour *mititei*). Nous avons trouvé 194 échantillons (42,35%) qui n'ont pas été en rapport de conformité avec les standards, surtout avec les chimiques (94,85%). Le plus souvent nous avons constaté des valeurs supérieures à celles acceptées pour le rapport collagène/protéines (60,1%) et pour les lipides (51,1%).

**Mots clé:** sécurité alimentaire, charcuteries, examens chimiques, rapport collagène/protéines

### Rezumat

Studiul nostru și-a propus evaluarea particularităților senzoriale, chimice și microbiologice ale unor preparate din carne provenite din unități de producție ale județului Dolj. Pe parcursul a 4 ani s-au recoltat 458 de probe de produse din carne (5 sortimente: parizer, crenvurști, salam de vară, cârnați oltenești și pastă de mici). Un număr de 194 de probe (42,35%) au fost necorespunzătoare, cu precădere (94,85%) prin nerespectarea parametrilor chimici. Cele mai frecvente abateri au constat în depășirea valorilor maxim admise pentru raportul substanțe colagene/proteine (60,1%) și pentru substanțe grase (51,1%).

**Cuvinte cheie:** siguranța alimentelor, preparate din carne, examinări chimice, raport collagen/proteine

## 1. Introduction

Much evidence from many civilizations has verified that the meat of wild and domesticated animals has played a significant role in human nutrition since ancient times.

In addition to the skeletal muscle of warm-blooded animals, which in a strict sense is „meat”, other parts are also used: fat tissue, some internal organs

and blood. Definition of the term „meat” can vary greatly, corresponding to the intended purpose. From the aspect of food legislation for instance, the term meat includes all the parts of warm-blooded animals, in fresh or processed form, which are suitable for human consumption (Belitz and Grosch, 1987).

Meat is necessary in our diet to stimulate human reactivity, the neural activity and to maintain the

working capacity. Meat consumers are stronger, better grown (height, weight), more dynamic and more enterprising comparing to those who prefer a vegetarian diet.

A big amount of high quality proteins, the presence of vitamin D, iron, phosphorus and other minerals offer this group of products precious properties and make it necessary for human nourishment. Eating meat every day helps children's and teenagers' growth, pregnancy, bettering after consuming diseases and makes our organism stronger towards toxics or infections (Dumitrache and Berilă, 1982).

Thus meat and meat products form a group of aliments necessary in human nourishment; they are usually eaten daily by an important part of the population, especially due to the eating traditions. In the same time we cannot ignore that, similar to other aliments, they can also lose their healthy properties and become risk factors for the consumers, as a result of losing hygienic and/or nutritive qualities (Prejbeanu, 2004).

It is obvious that our national authorities have to control if food safety standards are always respected ("from farm to fork").

In this context, we sought to evaluate the nutritive qualities and unsanitary potentials of some meat derivates from different production units of Dolj County.

## 2. Materials and methods

Our study lasted 4 years (2002-2005). The samples of meat products were monthly collected from production units considered representatives for Dolj County. They were analysed in the laboratories of Food Sanitary Chemistry and Microbiology of the Public Health Authority of the county. The analyses were run according to the official current standards (Colecție de standarde) and consisted in:

- sensorial analyses;
- chemical analyses: content of water, polyphosphates, lipids, proteins, collagen/proteins ratio, ammonium, starch, salt and nitrites;
- microbiological analyses: number/identification of coliphorm bacteria, *Escherichia coli* (*E. coli*), *Salmonella*, coagulation-positive *Staphylococcus*, *Bacillus cereus*, sulphite-reduction bacteria.

The results were compared to the minimum/maximum values from specific standards and from the Ministry of Health Regulation 975/1998 (Hygienic and sanitary standards for aliments).

## 3. Results and discussions

Salami and sausages manufacturing consists of grinding, mincing or chopping the muscle tissue and other organs and blending them with fat, salts, seasonings (herbs and spices) and, when necessary, with binders or extenders. The sausage mix or dough is then stuffed into cylindrical synthetic or cellulose casings or tubings of traditional sausage shape or, often, natural casings, such as hog or sheep intestines or the hog's bun (for liver sausage) are used. They are sold as raw, precooked or cooked and/or smoked sausages (Belitz and Grosch, 1987).

During our study we collected 458 samples of meat products; 229 (50%) were examined for sensorial and chemical properties and the other 229 (50%) - for microbiological ones.

Figure 1 presents the dynamics of the number of collected and analyzed samples.

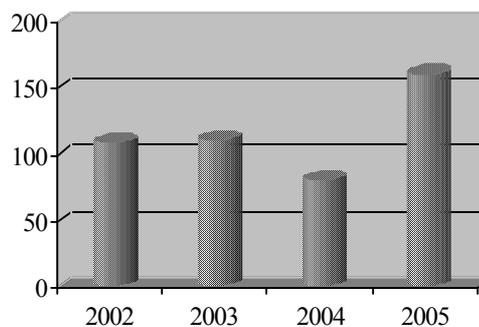


Figure 1. Dynamics of the number of samples collected and analysed

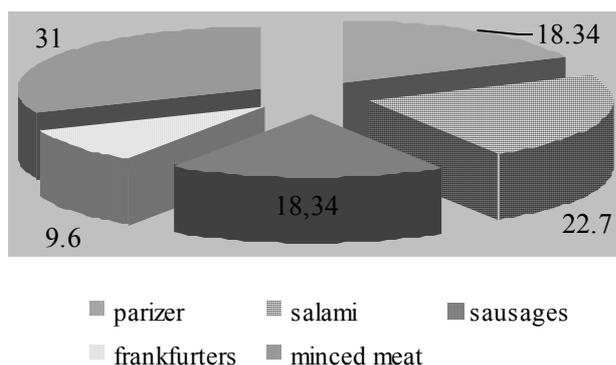
Most of the samples (N=160 representing 34.94% from the total number of samples) were collected in 2005, because new production units appeared then.

We collected samples from five assortments of products, frequently trade in the grocery shops:

- four kinds of salami and sausages: parizer (a kind of thick, rosy sausage made of boiled minced meat; a kind of mortadella), frankfurters, (summer) salami and smoked sausages;

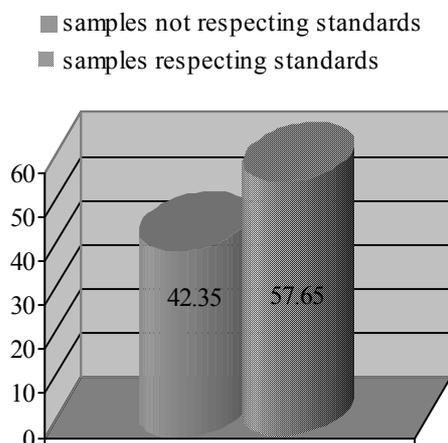
- *minced meat for mititei* (highly seasoned forcemeat small sausages broiled on the gridiron).

Figure 2 presents the statistical distribution of the different kinds of samples collected. There were only 9% of frankfurters because they were collected only in the first two years of the study.



**Figure 2.** Statistical distribution (%) of the samples related to the assortments of meat products

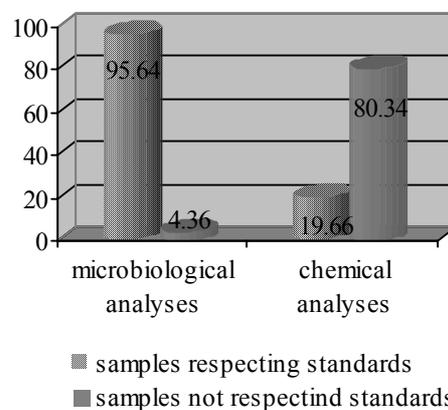
Figure 3 shows that 42.35% of the samples analysed (N=194) did not respect the recommended values for at least one of the parameters.



**Figure 3.** Statistical distribution (%) of the samples according to the standards

From the total number of 194 inadequate samples, only 10 (5.15%) registered deviations from the microbiological standards; the other 184 samples (94.85%) registered deviations of the chemical parameters.

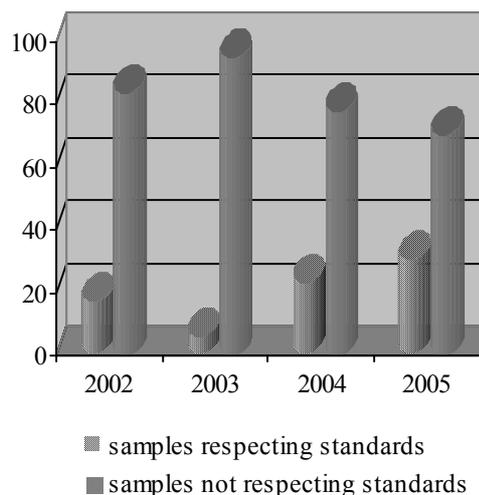
This discordant aspect between the microbiological and the chemical qualities of the samples is shown in figure 4.



**Figure 4.** Statistical distribution (%) of microbiological and chemical analyses in correlation with the standards

**Microbiological analyses.** In all ten cases, the microbiological nonconformity was due to the presence of a higher number of coliphorm bacteria and *E. coli*. There were nine samples of minced meat for *mititei* and one sample of sausages; the other three assortments of meat products respected the standards.

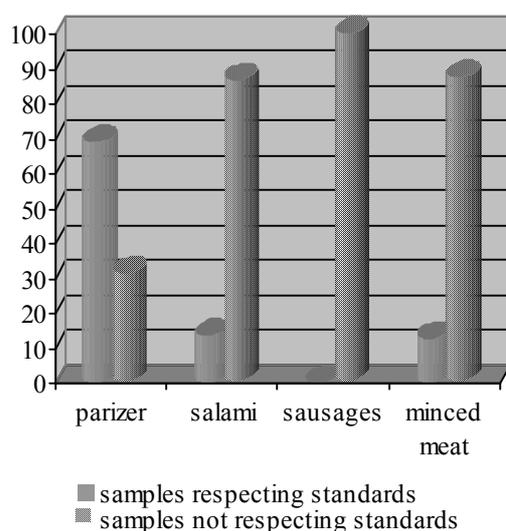
**Chemical analyses.** In dynamics, the statistical distribution of the samples related to the chemical analyses is shown in figure 5.



**Figure 5.** Dynamics of the statistical distribution (%) of the samples regarding the chemical parameters

It has to be noted the high percents (between 70 and 94.54) of meat products that did not respect the chemical standards.

Figure 6 shows this aspect for all assortments all study long (we excluded the frankfurters because of the inconsistency they were collected).



**Figure 6.** Statistical distribution (%) of every assortment samples regarding their chemical qualities

It has to point out that none of the sausages samples respected all the chemical parameters; we also found high percents of chemical inadequate salami and minced meat for *mititei* samples, through one, two or three parameters. The statistical analysis of the samples shows:

- the maximum acceptable values for **water content** were exceeded in 18 (34.6%) salami samples; this situation could reduce their preservation period;
- the **polyphosphates concentration** respected the maximum acceptable value. It is well-known that polyphosphates are used in meat products because of their ability to withhold water; more polyphosphates than the acceptable value would lead to the increase of water content and, thus, would decrease the preservation period of the product (Banu, 2000);
- higher **content in lipids** was observed in 51.1% of the samples, mostly in minced meat for *mititei* and smoked sausages. This fact generates reduced nutritive qualities (because of the atherosclerosis potential of animal lipids) and a higher energy value;

- 22 summer salami samples (44.2%) had less **proteins** than the minimum acceptable content;
- **collagen/proteins ratio** is the parameter that had most frequently inadequate values; the maximum limits were exceeded in 60.1% of the analysed samples (excepting minced meat where this parameter is not measured), especially in frankfurters and sausages (100% of the samples).

Not respecting the minimum protein content generates a reduced nutritive value of meat products. The result is the same if the maximum value of the collagen/proteins ratio is exceeded, because collagen (that comes from the conjunctive tissue, tendons, rind, sinew, skin, cartilages) is a protein with low biological value, with no tryptophan and only a few essential amino acids (Berilă et al, 2000; Mănescu et. al, 1982).

It cannot be ignored that protein derivates (different textures of vegetable or animal proteins) or mechanically deboned meat (MDM) can be used when preparing these products; this is another risk of lower nutritive value, but we did not have the necessary infrastructure to identify them (Mănescu, 1991).

- **ammonium dosage** (indicator of the freshness of the products) showed only standards samples;
- **starch identifying reaction** (an agent used to thicken) was negative for all samples;
- the **salt content** exceeded the limits only in five samples of minced meat for *mititei*;
- the **nitrites concentration** (used as preservatives, but also to maintain meat red colour) was under the limits for all samples.

It has to be mentioned that other food additives could be used when preparing meat derivates (flavours, antioxidants, colouring agents, etc), in order to improve products qualities; their use must respect current regulations referring to purity, type of products, maximum acceptable level, aspects that our study was not able to evaluate because we did not have the necessary infrastructure to identify them.

#### 4. Conclusions

From the total number of meat products tested for microbiological and chemical parameters, a significant percent (42.35%) were out-of standards

for at least one parameter. Most of deviations were chemical and referred to the collagen/proteins ratio and to the lipids content.

These remarks stand for the attention the public health authorities must pay to food safety. The subject is far from receiving the attention that it deserves and, in most countries, the issue of food safety and, in particular, health education in food safety, is frequently overlooked or receives low priority in public health programmes. Even if the authorities are conscious of the problem, very few have taken the step from recognition to action by developing a comprehensive, systematic and continuous programme of health education based on modern approaches to food safety.

Foodborne diseases are a widespread public health problem and a significant cause of reduced economic productivity. While the role of food producers and processors in ensuring food safety should not be underestimated, many cases of foodborne illnesses (if not most) could be prevented if consumers were better advised in the choice of their food. Today, there is a greater awareness among consumers. In many instances, this fact has been a consequence of negative publicity in the media, leading to a feeling of insecurity among consumers rather than to a sustained information and education campaign about consumer roles and responsibilities (WHO, 2000).

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