LUCRĂRI ŞTIINŢIFICE MEDICINĂ VETERINARĂ VOL. XL, 2007, TIMIŞOARA

THE MICROBIOLOGICAL QUALITY ANALISIS OF SOME MEET PRODUCTS TRADED ON BUCHAREST MARKETS

L. TUDOR, I. ŢOGOE, ELENA MITRĂNESCU

* Faculty of Veterinary Medicine Bucharest

Summary

The researches have been effectuated for determining the contamination grade of market meet products, following the supposition that all products are delivered on right analysis documents. It was analyzed a total number of 768 meet products samples. The samples have been harvested from 9 kinds of meet products from different market places.
The obtained statistical analyzed results have been permitted the conclusion that entire types of meet products have been recorded unconformity samples. It have been remarked either the getting over of some microbial parameters (coliforme bacteria's, coagulase-positive staphylococci, sulphite-reducing bacteria) or the presence of some pathogen and pathogen-conditioned bacteria (Clostridium perfringens has been isolated from 2.61 % samples, Proteus sp. has been isolated from 1.3 % samples).

Key words: meat products, analysis, bacteria's, contamination

The microbiological quality of meat products represents a food safety field since various diseases can be produced by having pathogens or conditioned pathogens bacteria in the foodstuffs, or due to nutritive substrate degradation and forming different type of toxic metabolites [2, 4 and 5].

Having in view the above mentioned aspects, during the past years large programs of upgrading the establishments have been carried and high quality equipment has been purchased ensuring the drop of contaminants number in the end product. For the same purpose new technology and new processing fluxes, more efficient and corresponding to the current processing hygiene requirements have been taken over and adapted. [5, 8].

The direct effect of those measures was the quality of foodstuffs analyzed immediately after processing, improving the microbiological and physic-chemical parameters of semi processed products and finite products, but it did not significantly influenced the quality of finite products analyzed on different market places.

It is important that food business operators have good knowledge of the hygiene concepts and focus on the entire food chain: raw material – finite product – placing on the market. Only a dynamic analysis of the meat preparations shall ensure safe products complying with all the hygiene requirements are placed on the market.

Materials and methods

Meat products samples have been taken from different commercialization places in Bucharest, the present research analyzing different assortments and types of products produced and placed on the market by different food business operators. The samples have been selected from the 3 big categories of meat products: products with over 60 % water content, products with 35 - 60 % water content and products with less than 35 % water content (dry raw products) have been used for this study.

The samples taken have been introduced into sterile recipients and have been transported in optimum temperature conditions. The samples have been analyzed in the food microbiology laboratory according to the STAS microbiological norms and the ISO standardized methods [10, 11].

The study was carried out over one year period (during 2006), 768 samples being analyzed (66 bratwurst samples, 98 traditional wurst samples, 96 summer salami samples, 89 pressed loin samples, 102 pressed ham samples, 128 beer sausages samples, 57 Sibiu salami samples, 54 babic samples and 78 Bucium sausages samples).

In order to determine the total number of mesophylic and aerobic germs, one-tenth dilutions in peptone water liquid breeding ground have been performed. 1 cm^3 of each dilution was distributed using sterile droppers in 2 Petri plates. In each plate melted and 40 – 45 °C chilled agar was outpoured, homogenized and incubated for 24 hours at 37 °C. The mean colonies number / g product has been determined [1, 3 and 11].

In order to determine the probable number of coliforme bacteria one-tenth dilutions have been performed, 1 ml of each dilution being introduced in 3 test tubes with BBLV breeding ground (lactose broth with bile salts and brilliant green) with Durham tube and incubated for 24 – 48 hours at 37 °C. The interpretation was made by the production of gas and calculating the 3 figures average (depending of turbidity developed by each tube with BBLV breeding ground). The obtained results have been interpreted using the Mac Grady table. In parallel was used the method for determining the probable number of coliforme bacteria by counting of colonies (ISO 4832). From each tenth dilution 1 ml was distributed with sterile droppers in two Petri plates; then in each plate VRBL breeding ground was dropped (gelose with lactose, bile salts, violet crystal and indicator) melted and chilled at 45 °C. After that the plates are being incubated at 35 °C for 24 hours. Following the incubation the red-violet colonies are counted and the average is calculated by the formula: $N = \Sigma c / (n_1 + 0,1\ n_2)\ d$ [where Σc is the sum of the counted colonies; n_1 is the number of plates with the first dilution which have been kept for counting; n_2 is the number of plates with the second dilution which have been kept for counting and d is the rate of diluting corresponding to the first used dilution [1, 3, 11].

Determining the total number of pathogen staphylococci was carried-out by a technique similarly with to the one used for determining the total number of aerobic

and mesophilic germs (TNAMG), using as solid breeding ground Chapman gelose or Baird Parker agar [3, 9].

Determining the total number of sulphite reducing bacteria was made on sodium sulphite and iron citrate breeding ground, melted and chilled at 45 °C; in this medium was homogenized 1 ml for each tenth dilution and then was incubated in anaerobic conditions at 37 °C for 24 – 48 hours; after incubation the black colonies have been counted [1, 3, 11].

In order to determine the pathogen and conditioned pathogen species the ISO standardized methods have been used: SR ISO 6597 – to identify Salmonella genus bacteria, STAS ISO 6888 to identify the positive plasma – coagulating staphylococci; SR 2356/1 to identify Proteus genus bacteria–, STAS ISO 4832 to identify Escherichia coli bacteria, SR ISO 7251 to determine the E. coli probable number, SR ISO 7932 to identify Bacillus cereus, STAS 12965 – 91 to determine the number of moulds and STAS 12964 – 91 to determine the number of yeasts , etc [1, 11].

All bacteria strains that have been isolated and initially identified as being pathogen or conditioned pathogen has been biochemical tested for confirmation diagnosis, thus the scientific data obtained being thoroughly proved.

Results and discussions

In order to have a comparison element and to understand the meaning of the results obtained the Order of the Health Minister No. 975 / 1998, on the hygienic-sanitary norms for food, was used to interpret the results. Table 1 presents the microbiological parameters provided in this order.

Table 1

Microbiological parameters for food and raw materials
(Order of the Health Minister No. 975/1998)

Crt No.	Food products	TNAMG	Coliforme	E. coli	Salmonella	SPCP	B. cereus	Bacteria SR	TNYM
1.	Minced meat and semi processed meat	-	1.000	100	absent	10	10	100	-
2.	Meat products salts / smoked	-	100	10	absent	10	10	100	-
3.	Raw dry Salami	-	-	-	absent	10	-	-	-
4.	Sausages (wurst, smoked specialties)	-	10	1	absent	10	absent	10	-
5.	Meat products, simple or combined, ready to eat	10.000	10	absent	absent	absent	-	absent	-

TNAMG - total number of aerobic and mesophilic germs
SPCP – coagulase positive staphylococci
Bacteria SR – sulphite reducing bacteria
TNYM – total number of yeast and moulds

The results obtained following the complete bacteriological analyze of each sample have been statistically integrated thus the average for each type of product being calculated.

The total number of mesophylic aerobic germs had mean values within relatively big variations: bratwurst – 2.4 x 10^3 ; traditional wurst – 1.7 x 10^4; Summer salami – 1.2 x 10^2; pressed loin – 2.9 x 10^2; ham – 2.1 x 10^2; Beer sausages - 4.8 x 10^4; Sibiu salami – 6.7 x 10^3; babic – 2.1 x 10^2; Bucium sausages – 2.7 x 10^2. Although for the analyzed types or assortments of meat products this parameter does not have a norm, we consider that the values obtained indicate an important number of contaminants.

The microbiological analyze performed to evaluate the number of coliforme bacteria, Escherichia coli, sulphite-reducing bacteria, coagulating-positive staphylococci and Bacillus cereus indicated that some results exceed the maximum admitted values. The number of samples that exceeded the maximum admitted values and the not complying samples are presented in Table 2.

Table 2

The microbiological analysis results for meat preparations samples

Type of product	The analyzed microbiological parameter									
	Coliforme		E. coli		SPCP		B. cereus		SR bacteria	
	No. of samples	%	No. of samples	%	No. of samples	%	No. of samples	%	No. of samples	%
Bratwurst	11	16.67	5	7.57	17	25.76	5	7.57	1	1.51
Traditional wurst	18	18.37	9	9.18	19	19.39	1	1.02	5	5.10
Summer salami	6	6.25	2	2.08	4	4.17	3	3.12	-	-
Pressed loin	5	5.62	-	-	3	3.37	2	2.25	2	2.25
Ham	4	3.92	-	-	2	1.96	1	0.98	-	-
Beer Sausages	19	14.84	14	10.94	21	16.41	5	3.91	10	7.81
Sibiu salami	-	-	-	-	15	26.32	-	-	-	-
Babic	-	-	-	-	3	5.56	-	-	-	-
Bucium Sausages	-	-	-	-	8	10.26	-	-	-	-

TNAMG - total number of aerobic and mesophilic germs
SPCP – coagulase positive staphylococci
Bacteria SR – sulphite reducing bacteria
TNYM – total number of yeast and moulds

The statistical analyze of the obtained results leaded to the conclusion that most of the products had non-complying samples.

No Salmonella genus bacteria have been isolated in the analyzed samples. However Proteus and Clostridium genus bacteria have been isolated and also a total number of fungi (yeasts and moulds) more then 1 x 10^4. Some preparations

indicate the presence of mould species that either produce toxic compounds (Aspergillus), or degrade the biochemical structure of the preparations and modify the organoleptic indicators (sensorial analyses) (Mucor sp.). The number of positive samples and the determined percent of all the analyzed samples for each type of product is presenting in Table 3.

Table 3.

The microbiological analysis results for the meat preparations samples

Type of product	The analyzed microbiological parameter									
	Proteus sp.		Clostridium perfringens		NTF		Aspergillus sp.		Mucor sp.	
	No. of samples	%	No. of samples	%	No. of samples	%	No. of samples	%	No. of samples	%
Bratwurst	-	-	2	3.03	2	3.03	-	-	-	-
Traditional wurst	-	-	4	4.08	-	-	-	-	-	-
Summer salami	-	-	1	1.04	-	-	-	-	-	-
Pressed loin	-	-	-	-	1	1.12	-	-	-	-
Ham	-	-	-	-	-	-	-	-	-	-
Beer Sausages	2	1.56	3	2.34	5	3.19	2	1.56	-	-
Sibiu salami	1	1.75	5	8.77	6	10.53	6	10.53	8	14.03
Babic	3	5.56	3	5.56	3	5.56	3	5.56	2	3.70
Bucium Sausages	4	5.13	2	2.56	4	5.13	2	2.56	2	2.56

NTF – total number of fungi

Based on the results obtained following the bacteriological analyzes, it is demonstrated that a series of products are contaminated either during transportation, either directly at placing on the market, due to storage in non-compliant conditions or due to maintaining in temperature conditions inadequate for the type of product.

The presence of Aspergillus and Mucor species was determined for Sibiu salami and Bucium sausages maintained at refrigeration temperatures (0–6 °C), leading to the humectation of the membrane and actually favoring the growth of the moulds spores (this being a frequent finding for raw dry products maintained at law temperature for many weeks) [4, 5, 6, 7].

Conclusions

3.1. Microbiologically non-compliant samples have been detected for all the analyzed types of products. The biggest number of non-compliant samples for most of the analyzed parameters was found in 3 types of products: Bratwurst, Traditional wurst and Beer sausages.
3.2. Following the microbiological analyses no samples contaminated with Salmonella genus germ for any of the products have been detected.
3.3. The microbiological exam performed to identify Proteus genus bacteria indicated the presence of those bacteria in 8 samples, 4 of which belonging to one type of product (Bucium sausages).
3.4. Clostridium perfringens was identified in 16 samples (2.61 % of the entire analyzed samples) - the highest number of positive samples was identified for assortments: Traditional wurst (4.08 %) and Sibiu salami (8.77 %).

References

1. **Bărzoi D.** – Microbiologia produselor alimentare de origine animală. Ed. Ceres, Bucureşti, 1985.
2. **Bărzoi D., Meica S., Neguț M.** – Toxiinfecțiile alimentare. Ed. Diacon Coresi, Bucureşti, 1999.
3. **Bărzoi D., Apostu S.** – Microbiologia produselor alimentare. Ed. Risoprint, Cluj-Napoca, 2002.
4. **Bondoc I., Şindilar E.V**. – Controlul sanitar veterinar al calității şi salubrității alimentelor, Vol I. Ed. "Ion Ionescu de la Brad", Iaşi, 2002.
5. **Ciocârlie Nicoleta, Tudor L., Ceauşi C.** – Controlul calității cărnii. Ed. Printech, Bucureşti, 2002.
6. **Popa G., Stănescu V.** – Controlul sanitar veterinar al produselor de origine animală. Ed. didactică şi pedagogică, Bucureşti, 1981.
7. **Popescu N., Meica S.** – Bazele controlului sanitar veterinar al produselor de origine animală. Ed. Diacon Coresi, Bucureşti, 1995.
8. **Rotaru O., Mihaiu M.** – Igiena veterinară a produselor alimentare. Ed. Risoprint, Cluj-Napoca, 2001.
9. **Savu C., Carmen Petcu –** Igiena şi controlul produselor de origine animală. Ed. SemnE, Bucureşti, 2002.
10. **Tudor L.** – Controlul sanitar veterinar şi tehnologia produselor de origine animală. Ed. Printech, Bucureşti, 2005.
11. ***FAO – OMS** – Norme internaționale de igiena cărnii. Traducere, SMV, Bucureşti, 1980.
12. ***SR – ISO** – Standarde de analize microbiologice pentru produsele de origine animală.