RESEARCH REGARDING MICROBIOLOGICAL CONTAMINATION FOR SOME FOOD PACKING USE

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Abstract. *Packaging constitutes an important source of contamination through contact, so the raw material in the first phase of the technological process and the finished product. The microorganisms that may be present on the surface of the packaging can be grouped into two categories: saprophytic microorganisms and pathogenic microorganisms.*
Between 1.01. 2014 - 31.12.2015 we examined 189 sample packages. The samples were examined following exams: Total number of germs detection (EN ISO 4833), coliform bacteria (ISO 4831 and 4832), and yeasts and molds (ISO 21527-1). The results show that packaging can be a source of microbiological contamination for the food.

Keywords: contamination, expertise, microorganisms, packaging for food.

1. Introduction

The main regulations of the European Commission on materials and articles intended to come into contact with food are: EC Regulation no. 1935/2004 of the European Parliament and of the Council of 27 October 2004; EC Regulation no. 2023/2006 of 22 December 2006; EC Regulation no. 450/2009 of 29 May 2009; EC Regulation no. 10/2011 of 14 January 2011; [10,11,12,13]

Packages are subject to these regulations: active and intelligent materials and articles; adhesives; ceramics; cork; rubber; glass; ion exchange resins; metals and alloys; paper and cardboard; plastic materials; printing inks; regenerated cellulose; silicon; textile; paints and coatings products; wax; wood.

The provisions shall not apply to materials and articles which are supplied as antiques; covering or coating materials, such as the materials covering cheese rinds, prepared meat products or fruits, which form part of food and may be consumed together with this; fixed public or private water supply.

Any material or article intended to come into contact directly or indirectly with food must be sufficiently inert to prevent the transfer of constituents to food in quantities large enough to endanger human health or cause an unacceptable change in food composition or alteration of its organoleptic properties.

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Through intelligent materials and means materials and articles which monitor the condition of packaged food or the environment surrounding the food and by active materials and articles, materials and articles that are intended to extend shelf-life or to maintain or improve the condition of packaged food; they are designed to deliberately incorporate components that would release substances into the packaged food or the environment surrounding the food or absorb substances from the packaged food or the environment surrounding the food.

Packaging constitutes an important source of contamination through contact, so the raw material in the first phase of the technological process and the finished product. The microorganisms that may be present on the surface of the packaging can be grouped into two categories: saprophytic microorganisms (Pseudomonas, Micrococcus, Proteus, Streptococcus, Escherichia, Mucor, Rhizopus, etc.) and pathogenic microorganisms (Salmonella, enteropathogenic Escherichia coli, Staphylococcus aureus, Yersinia enterocolitica Campylobacter jejuni, Clostridium perfringens, Clostridium botulinum, Listeria monocytogenes). Packages are contaminated with Salmonella most often and Clostridium perfringens. [1,3,4]

The evolution of microorganisms that may be present on the surface of the packaging depends on the factors such as the intrinsic structure of the package, and the pH of the composition; Extrinsic factors armed with atmospheric relative humidity and temperature of storage space.

Consequences multiplication of microorganisms on the surface of the packaging may be economic - alteration and health - causing poisoning. Natural casings (Pickled) have a high microbial load as they came into contact with the intestinal microbiota (coliform and other bacteria from rotting). From the microbiological point of view artificial membranes typically have a low load but can sometimes help with uploading product spoilage microorganisms. [3]

The National Program of Strategy stipulates that supervision by laboratory testing during the production of other products that come into contact with animal products is a biannual through microbiological examinations, which are: Detection of Total plate count, coliforms and yeasts and molds. [5,6,7,8,9]

2. Materials and methods

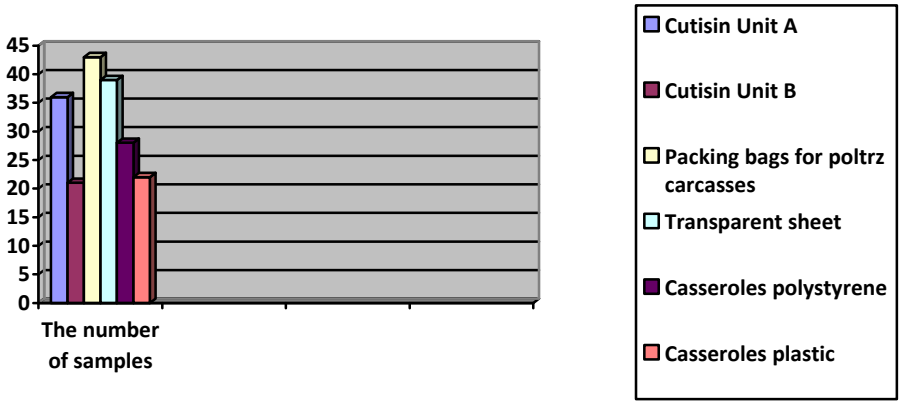
Between 1.01. 2014 - 31.12.2015 in Brasov Sanitary Veterinary and Food Safety Laboratory we examined 189 samples packages, as follows: (Table. 1 and Chart no. 1)

Table no. 1
The number of samples

Nr. Crt.	Unit	Type of samples		Number of samples	%
1.	A	Cutisin for packaging various types of salami, baloney and drums		36	19.05
	B	Cutisin for packaging various types of salami, baloney and drums		21	11.12
2.	C	Packing bags for poultry carcasse		43	22.75
		Transparent sheet		39	20.63
		Casseroles	Polystyrene	28	14.81
			Plastic	22	11.64
	Total			189	100

Chart no. 1

The number of samples



Samples were tacken from 3 processing units in the county of Brasov, which is composed of cutisin with different uses (packaging some types of salami, baloney and drums), packing bags poultry carcasses, transparency and containers of polystyrene and plastic .

Sampling is governed by Order no. 13 of 24 January 2005 of National Sanitary Veterinary and Food Safety Authority, which regulates the sampling of animal products, products containing raw materials of animal origin ingredients contained in animal products or materials that come into contact with them in order laboratory examination.

Sampling for sending to the laboratory was performed under aseptic conditions. For packaging and sealing of the samples were used for polyethylene for food packaging, the first-time use. These packaged, labeled and sealed were sent to the laboratory within 24 hours.

If artificial membranes for microbiological examination were collected by survey totaling a minimum of 2 m linear portions. (Picture no. 1, 2, 3, 4)

Photo. no. 1 and 2 Cutisin - Polyamide Cooper

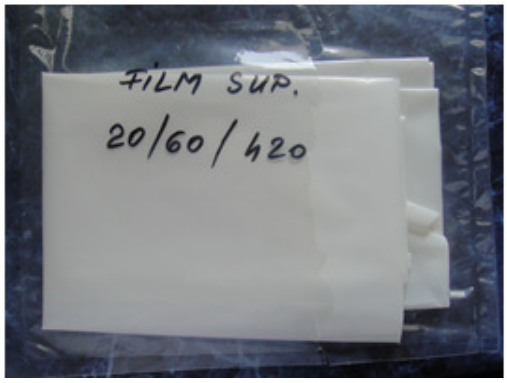


Foto No. 3 and 4 *Transparent sheet*

For microbiological control of others packages were collected by sampling a minimum of 5 and a maximum of 10 containers, so that their total capacity to be a minimum of 1 liter. (Photo no. 5, 6, 7, 8)

Photo. 5 and 6. Plastic bags for packing poultry carcasses

Photo. 7. Polystyrene Casserol

Foto nr. 8. Plastic Casserol

In the case of sampling with a view to their microbiological examination were used sterile saline or sterile distilled water. The washing liquid aseptically prepared in advance was inserted aseptically into the vessel to be controlled. The amount of the washing liquid was equal to 1/100 of the capacity of the vessel to control, and 1 ml of the washing liquid was 100 ml of capacity of the container.

Containers (ex. Trays of plastic and polystyrene) were covered with foil sterilized, and plastic bags for packaging of poultry carcasses, introduced washing liquid, then stirred well by movements in different directions, so that liquid to pass through the same place at least 10 times. It was later collected aseptically washing liquid, which resulted in ships and was immediately inserted in it.

The samples were conducted following exams: Total germ detection (EN ISO 4833), coliform bacteria (ISO 4831 and 4832), and yeasts and molds (ISO 21527-1).

Total Number of Germs determination

The method consist in determining the organotrofe aerobic bacteria mesophilic and is based on the fact that microbial cells present in the sample in contact with the culture medium (Plate Quantum Agar - PCA), will form each of visible colonies after incubation at 30oC for 72 hours.

Seeding was carried out by incorporating and mixing gently in growth medium inoculum of a known amount of the sample in the case of the rinsing liquid or by the deposit directly on the surface of solid culture medium wrapping portions (about 1 cm2). (Photo no. 9 and 10)

Photo no. 9 Sampling taking

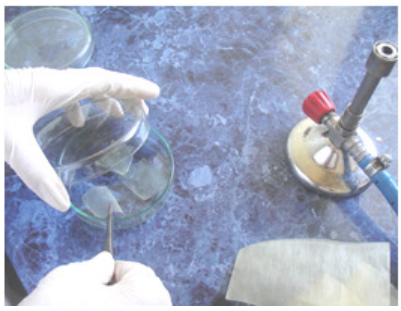


Photo no. 9 Deposition on the surface of the culture medium

Glassware was sterilized employed in oven at 180° C for 30 minutes, and the medium sterilized at 121°C for 30 minutes.

Petri plates were incubated at 30° C for 72 hours and after the period of incubation colonies were counted in each box. (Photo no. 11, 12)

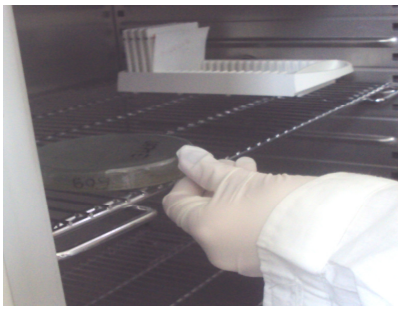


Photo no. 11. Introducing plates to incubator

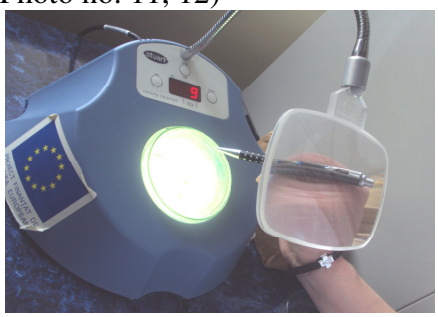


Photo no. 12. Counting of colonies

Determining the number of coliforms

Sowing of three tubes enrichment medium selective double-concentrated liquid (broth lauryl sulphate and sodium tube Durham) with a quantity of sample for testing if the product examined is liquid and a quantity of sample where portions of unit dose. (Photo no. 13 and 14)

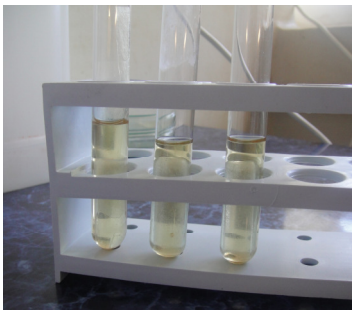


Photo no. 13. Tubes with enrichment medium

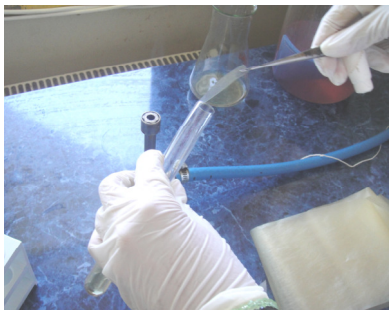


Photo no. 14. Seeding sample

Incubating the tubes with double concentradet medium for 24 hours and concentrated tubes with medium alone for 24 or 48 hours at a temperature of 35°C or 37°C.

Seeding with a loop coil of one tube with the tube set confirmation medium Durham tubes fermentation in which the product gas evolution. Incubate at 35°C and 37°C for 24-48 hours. (Photo no. 15 and 16)

Photo no. 15 Tubes with Durham Tubes

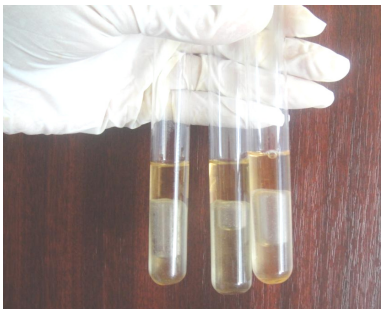


Photo no. 16. Fermentation with gas production

Based on the number of tubes showing gas evolution, is to determine the probable number of coliform bacteria per ml or per gram of sample.

Determination of yeasts and molds

Diagnostic procedure establich the count of viable yeasts and molds by colony count technique at 25°C. Yeasts and molds are microorganisms that form colonies at 25°C on selective medium specific.

The methodology of diagnosis was performed in accordance with ISO SR 21527/1 or 2. The culture medium used was agar DG 18 and the dilution solution we used distilled or deionized water. Sowing was done as with NTG. (Photo no. 17 and 18)

Photo no. 17. Seeding sample

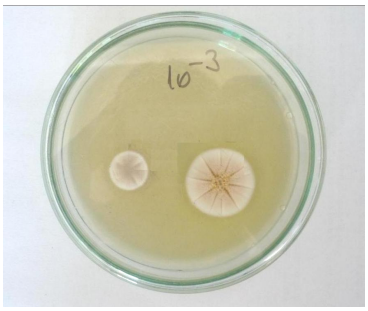


Photo no. 18. Moldsi

3. Results and discussion

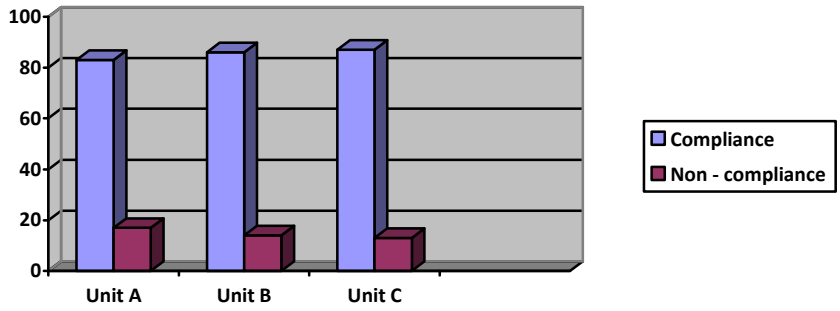
After analyzing samples from the 3 units provenance we obtained the following results (Table no. 2 and Chart no. 2)

Table no. 2

The number of examined samples and the results obtained

Nr. Crt.	Unit	Type of samples		TNG				
				Number of samples	Obtained results			
					Compliance		Non-compliance	
					No.	%	No.	%
1.	A	Cutisin for packaging various types of salami, baloney and drums		36	30	83.34	6	16.66
2.	B	Cutisin for packaging various types of salami, baloney and drums		21	18	85.71	3	14.29
3.	C	Packing bags for poultry carcasse		43	36	83.72	7	16.28
		Transparent sheet		39	37	97.87	2	2.13
		Casseroles	Polystyrene	28	23	82.14	5	17.86
			Plastic	22	19	86.36	3	13.64
	Total				163	86.52	26	13.48

Chart no. 2
The number of examined samples and the results obtained



Most noncompliance occurred at Unit A (16.66%), then descending at Unit B (14.29%) and Unit C (12.9%).

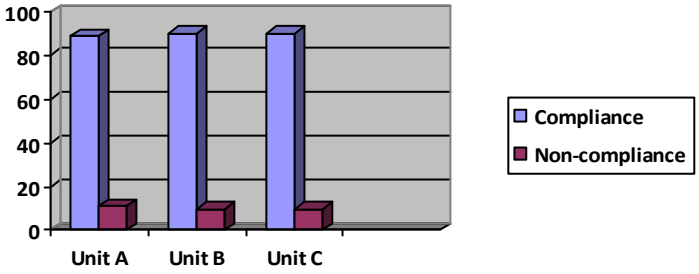
Of the total samples analyzed it was found that 13.48% were non-compliant, the percentages ranging from 2.13 to 17.86% in the transparency or polystyrene trays for the same Unut - Unit C.

After analyzing samples for determining coliforms, taken from the 3 units of origin following results were obtained: (according to Table no. 3 and Chart no. 3)

Table no. 3
The number of examined samples and the results obtained

Curr. No.	Unit	Type of samples		Coliforms				
				Number of samples	Obtained results			
					Compliance		Non-compliance	
					No.	%	No.	%
1.	A	Cutisin for packaging various types of salami, baloney and drums		36	32	88.89	4	11.11
2.	B	Cutisin for packaging various types of salami, baloney and drums		21	19	90.48	2	9.52
3.	C	Packing bags for poultry carcasse		43	38	88.37	5	11.63
		Transparent sheet		39	37	94.87	2	5.13
		Casseroles	Polystyrene	28	25	89.28	3	10.72
			Plastic	22	19	86.36	3	13.64
	Total			189	170	89.71	19	10.29

Chart no. 3
The number of examined samples and the results obtained



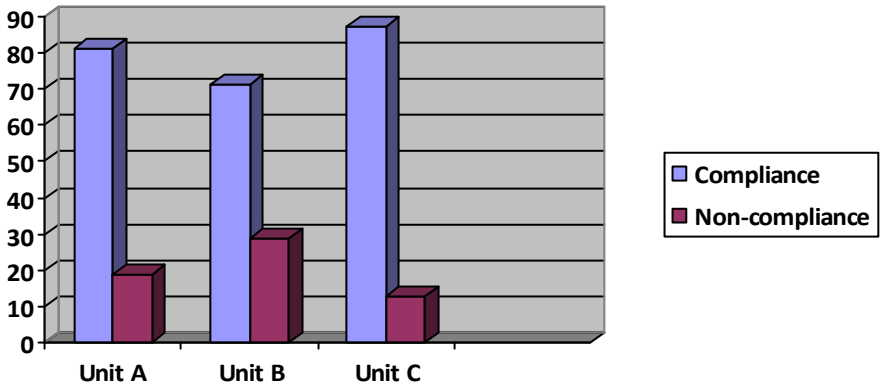
Most noncompliance occurred at Unit A (11.11%), then descending Unit C (9.85%) and Unit B (9.52%).

Of the total samples analyzed it was found that 10.29% were non-compliant, the percentages ranging from 5.13 to 13.64% in the transparency or plastic trays for the same Unut - Unit C.
After analyzing samples of the 3 units provenance yielded the following results: (see Table no. 4 and Chart no. 4)

Table no. 4
The number of examined samples and the results obtained

Curr. No.	Unit	Type of samples		Coliforms				
				Number of samples	Obtained results			
					Compliance		Non-compliance	
					No.	%	No.	%
1.	A	Cutisin for packaging various types of salami, baloney and drums		36	29	80.56	7	19.44
2.	B	Cutisin for packaging various types of salami, baloney and drums		21	15	71.43	6	28.57
3.	C	Packing bags for poultry carcasse		43	35	81.40	8	18.60
		Transparent sheet		39	36	92.31	3	7.69
		Casseroles	Polystyrene	28	26	92.86	2	7.14
			Plastic	22	18	81.82	4	18.18
	Total			189	159	83.40	30	16.60

Chart no. 4
The number of examined samples and the results obtained



Most noncompliance occurred at Unit B (28.57%), then descending Unit A (19.44%) and Unit C (12.88%).

Of the total samples analyzed was found that 16.60% were non-compliant, the percentages ranging from 7.14 to 28.57% in polystyrene trays for Unit C, respectively cutisin for packaging various types of salami, baloney and drums at Unit B.

Results showing higher values than the allowable limits (NTG - 1 / cm2 Coliform bacteria - 3 / cm2, total number of yeasts and molds - absent) are considered unsatisfactory and can mean: cross-contamination or intersections of phases salubrious those unsanitary within functional circuits (ie. touch with the circuit packaging waste) handling, maintenance and / or improper storage, packaging, etc.

The results were brought to the attention of non-compliant operators, who analyzed the possible causes of the occurrence of nonconformities and corrective established deadlines, penalties and increase the frequency number of samples

Conclusions

[1] In case of TNG, 13.48% from all samples analyzed were non-complied, percentages ranging from 2.13 to 17.86% in the transparency or polystyrene trays;

[2] In case of coliform 10.29% from all samples analyzed were non-complied, percentages ranging from 5.13 to 13.64% in the transparency or plastic containers;

[3] In case of yeasts and molds 16.60% from all samples analyzed were non-complied, percentages ranging from 7.14 to 28.57% in polystyrene trays;

[4] The results wich indicate higher values than the allowable limits, may signify: intersections of cross contamination or salubrious phases with the unsanitary within functional circuits (ie. Touch with the circuit packaging waste) handling, maintenance and / or improper storage, packaging, etc .;

[5] The packaging can be sources of microbiological contamination of food.

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[11] EC Regulation no. 450/2009 of 29 May 2009;
[12] EC Regulation no. 10/2011 of 14 January 2011