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Assessment of the process hygiene and safety meat products RTE, produced in the region of Tirana

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Abstract:

The foodborne diseases place an important role for public health, because they cause not only infection to constumers, but they also cause considerable economic problems. In this study we have tested three RTE meat product categories: salami with termic preparation –RTE , salami with fermentation process –RTE, sliced packed meat products. A total of 120 samples were analysed, during 10 months period, from which 60 samples collected to establishments implemented the HACCP system, 60 other samples to establishments implemented GMP. The microbiological quality, the hygiene of process and product , was based on the determination of the number of *E.Coli* and also the presence or the absence of Salmonela spp. The RTE products hygiene estimated from the level of E.Coli was resulted in satisfactory levels, whithout the presence of *E.Coli* in 108 samples or 90.0% of the total , but in 12 samples or 10.0% of them *E.coli* was isolated at level 16 cfu/g to 70 cfu/g. The product with the highest level was sliced salami. Refer to the implemented system from establishments, HACCP or GMP,7.5 % of pozitive *E. coli* samples, belongs to subjects that implemented Good Manufacture Practise, 2.5 % others belongs to establishment with HACCP system. *Salmonela spp.* was not determinated. This study showed the importance of HACCP implementation system in food proccesing industry, in aim to get safe ready to eat meat products.

Keywords: RTE meat products, microbiological quality, *E.coli, Salmonella spp,* HACCP, GMP system.

1. Introduction

Interest of consumers towards foods with high nutritional value that guarantee safety from pathogens, the increased frequency of eating outside [18], the use of partially cooked food, without monitoring their preparation [6, 2, 1], has stimulated interest in producing meat ready to be eaten, partly fermented meat products [5] because the processes used in the manufacture, and specification of the content inhibit the growth of pathogenic bacteria. These meat products do not require further treatment before consumption [19] (such as heating or cooking), the absence of pathogenic microorganisms in these products is fundamental. The process of producing meat products generally includes traditional techniques; however, to have a safe product one should guarantee the microbiology of these processes. This is partly provided by the microenvironment of meat, for example, fermented sausages have a pH of 4.6 to 5.3, which will hinder the growth of many microorganisms [9]. When the fermentation process is not properly conducted, there is a potential risk that some microbiological food pathogens can survive andreproduce during baking [3]. RTE food microbiological quality depends greatly in the technology that is used, in the quality of meat as raw material, in spices and handlers during processing, in the cooking process inefficiency, in the low sanitary practices, in the equipment and cooking / processing [9] which affect the status of microbiological products [16]. According to WHO [21], the staff involved in the entire chain of production and preservation products plays an important role in ensuring the safety of the product. If one or more of these factors are neglected then consumer's health is in danger [7, 10]. Good hygiene practices, and the HACCP system play an important role in preventing the occurrence of pathogens in RTE meat products. Therefore, the goal of our study relates to the assessment of the hygiene process and safety RTE meat -based products produced in the region of Tirana by measuring the number of *E. coli* and determining the presence or absence of *Salmonella spp*.

2-Material and Methods

2.1 Collection of samples

In total there are analyzed 120 samples, 40 RTE thermally processed sausage, 30 RTE fermented

sausage, 30 samples of sliced sausage and 20 samples sliced bacon. The sampling it was conducted to two type of plants:

-The establishment with implementation of HACCP system

-The establishment with implementation GMP

2.2 Microbiological analysis

2.2.1 Escherichia Coli analysis.

The "Sample preparation" was referred to ISO 6887-1 [11], where 10 gr of sample were weight and homogenized with 90 ml of BPW. Using the pipettes,will transfer them in Petri sterile plates (1 ml of primary and serial dilutions). In every Petri sterile plate we put 15 ml of TBX media, warmed before in 44°C – 47°C. After that we mixed inoculate to the media as soon as it possible and we let it to be hardened in a cold horizontal surface. Then we turn overthrown the plates and we put them in a thermostat, at 44°C for 18-24 hours. The total incubation time should not be more than 24 hours. The enumeration technique of colonies in plate in 44°C by using 5-bromo-4-chloro-3-indolyl β-glucuronide and results expressed it was perform according to the standard method – ISO/TS 16649-2 [10] , the horizontal method for enumeration of *Escherichia coli* β -glucuronidase-positive.

2.2.2 Detection of Salmonella spp.

Detection of Salmonella it was based in EN ISO 6579-2002- Am/2004, an international accredited method, which has passed through 4 phases:

1st Phase: (Pre enrichment) in a liquid unselective media. After the preparation of the prove sample, 25 gr of the sample +255 ml BPW, we homogenised and incubated it in at 37°C for 18 hours.

2nd Phase: (Enrichment) in a liquid selective media. After we transferred 0.1 ml and incubated the culture, in a tube that has 10 ml RVS, we incubated it at 41.5° C for 24 hours, plus 1 ml incubated culture in 10 ml MKTTn which was also incubated at 37° C for 24 hours.

3rd Phase: The planting in a plate and isolation. It was taken with an (Anza) from RVS and was inoculated in two XLD plates, a solid selective media and two other plates from HEA solid selective media and we incubated them at 37°C for 24 hours. Then we took with an (Anza) from the MKTTn and after we inoculate the culture to two XLD and HEA plates and incubated at 37°C for 24 hours.

4rth Phase: Isolation and confirmation. The plates were examined for the presence of Salmonella colonies. Suspected colonies on agar plates, were transferred to Kligler agar, and were incubated at 37°C for 24 to 48 h. Gram staining and biochemical tests such as the presence of catalase, oxidase, sulfide – indole- motility (SIM) medium (sulfur reduction test, indole production, motility) were perform.API 20 E, it was used for further biochemical identification and confirmation. Serological tests it is used to.

3. Results

These microbiological results are interpreted in accordance with microbiological criteria detailed in Table1. These criteria use the presence (or level) of bacterial contamination as an indicator of food security, and classify RTE foods by microbiological quality as satisfactory, acceptable, unsatisfactory or unacceptable (potentially dangerous).

Table 1: Microbiological criteria (Regulation EC 2073/2005)

Criteria	***Microbiological quality cfu/g***			***Regulation (EC) No. 2073/2005:***
	Satisfactory	**Acceptable**	**Unsatisfactory**	**Food safety criteria**
E.Coli	<20	20 - $<10^2$	$>10^2$	-
Salmonela spp.	Absence in 25 g	-	-	-

Table No. 2 presents the results for the three categories of meat products included in the study. There is a total of 120 samples analyzed, 40 of which were thermally processed sausage in none of the samples is observed the presence of *E.coli*. Out of 30 samples of fermented sausage in none of them is found the presence of *E.coli*. However, in 50 samples of packaged sliced meat products RTE showed that *E. coli* was present in six samples (sliced sausage) and in 3 samples of sliced bacon.

Comparing these results withthe data presentedbelow (Table 3), one can see that in subjects which implement HACCP only three samples (sliced sausage) resulted in lower *E.coli* load ranging from 2-3 cfu/g-16cfu/g.

In all the subjects that implement GMP it is observed that 48 samples or 80% of them showed no microbial load, 3 samples or 5% of them result with low load ranging from *E.coli* 2-3 cfu/g to 16 cfu/g, and 9 samples or 10% load from 25-70 cfu/g. The product that has the highest load is sliced sausage.

Table 2. The microbic count of *E.coli* in meat products

Type of product		**NR**	**Level of *E.coli* cfu/g**		
			0	≤20	>20
RTE thermally processed sausage		40	40	0	0
RTE fermented sausage		30	30	0	0
Packed meat products	**Sliced sausage**	30	21	3	6
	Sliced bacon	20	17	0	3
Total		120	108	3	9
In percentage %		100%	90 %	7.5 %	2.5%

Table 3. Microbiological quality of meat products subject of HACCP.

Type of product		**NR**	**Level of *E.coli*cfu/g**		
			0	**≤20**	**>20**
RTE thermally processed sausage		20	20	0	0
RTE fermented sausage		15	15	0	0
Packed meat products	**Sliced sausage**	15	12	3	0
	Sliced bacon	10	10	0	0
Total		60	57	3	0
In percentage %		100%	95 %	5 %	0 %

Table 4. Microbiological quality of meat products produced using good practices

Type of product		**NR**	**Level of *E.coli* cfu/g**		
			0	**≤20**	**>20**
RTE thermally processed sausage		20	20	0	0
RTE fermented sausage		15	15	0	0
Packed meat products	**Sliced sausage**	15	6	3	6
	Sliced bacon	10	7	0	3
Total		60	48	3	9
In percentage %		100%	80%	5%	15%

Table 5. Microbiological quality of meat products/ ***Salmonela spp.*** **in two establishments** HACCP and GMP[1].

Type of product		***NR***	***Salmonella spp***	
			Presence	**Absence**
RTE thermally processed sausage		40	-	40
RTE fermented sausage		30	-	30
Packed meat products	**Sliced sausage**	30	-	30
	Sliced bacon	20	-	20
Total		100	-	100
In percentage %			-	100 %

[1]Good Manufacture Practices

The goal of our study is to collect samples of both types of processing entities in Tirana region and to analyze them for the presence of *Salmonella spp*. Our experiments show that the presence of *Salmonella spp* was not observed in any of the samples.

4. Discusion

We analyzed a set of 120 samples and only 10 % of them contained *E.coli*. This presence shows that one should implement strictly sanitary and hygienic rules in the critical items ranging from raw materials, the process of processing, to the final product. Researchers from different countries have reported that in various technological sanitary and hygienic conditions in Taiwan the presence of the bacteria varies from 5-7 % (samples are taken in supermarkets) [15], whereas in new Zealand [8] were reported that the presence of the bacteria is at the level of 11 % of the samples with load 4 to 75 cfu/g. The absence of *Salmonella*in the analyzed samples shows a careful control in each of the processes included. This study is consistent with studies reported [17] who found no *Salmonella*in raw and RTEsamples from 20restaurants university in Valencia, Spain. Umoh and Odoba [19] also showed that none of the samples traded in RTE food stores were not contaminated with Salmonella. These results are similar with the results of research conducted [4] in a military hospital in Ankara, Turkey. Research in the United Kingdom [14] also revealed the lack of this pathogen in studying microbiological quality of RTE foods between 2003 and 2005 in Wales. Absence of *Salmonella* in these studies showed that if practices of good hygiene are implemented in all steps of the process, then food security is guaranteed for the consumers.

5. Conclusions

This study showed the importance of HACCP implementation system in food proccesing industry, in aim to get safe ready to eat meat products.

6. References

1. Abdalla MA, Suliman SE and Bakhiet AO.: **Food safety knowledge and practices of street foodvendors in Atbara City (Naher Elneel State Sudan).** African Journal of Biotechnology, 2009, 8 (24): 6967-6971.
2. Abdalla MA, Sihanm E S, Alian YYHA, Amel OB.: **Microbial content of the domestic refrigerators in Khartoum area (Kharrtoum North).** Sud. J. Vet. Sci. Anim. Husb. 2008 a, 47 (1&2): 15-23. **Food safety knowledge and practice of street food-vendors in Khartoum city Sud**. J. Vet. Sci. Anim. Husb, 2008 b, 47 (1&2): 126-136.
3. Adams M and Mitchell R.: **Fermentation and pathogen control: a risk assessment approach**. Int. J. Food Microbiol, 2002, 79: 75–83.
4. Aycicek H, Sarimehmetoglu B and Cakiroglu S.: **Assessment of the microbiological quality of meals sampled at the meal serving units of a military hospital in Ankara, Turkey**. Food Control, 2004, 15: 379-384.
5. Bohaychuk VM, Gensler GE, King RK, Manninen KI, Sorensen O, Wu JT, Stiles ME and Mcmullen LM.: **Occurrence of pathogens in raw and ready-to-eat meat and poultry products collected from the retail marketplace in Edmonton, Alberta, Canada**. Journal of Food Protection 2006, 69: 2176- 2182.
6. Ekanem EO.: **The street vended trade in Africa. Safety and social environmental issues**. Food Cont. 1998, 4: 211 – 215.
7. Evans MR, Salmon RL, Nehau L, Mably S, Wafford L, Nolan-Farret MZ, Gardac D, Robiero CD.: **An outbreak of Salmonella typhimrium associated with kebab meat and yoghurt relish**. Epidemiol Infect. 1999, 121: 377–383.
8. Millard G and Rockliff S.: **Microbiological quality of ready to eat foods**. Health protection service**,** September 2000 - August 2001.
9. Greig J, Nesbakken T, Stephan R and Kasuga F.: **Meat and meat products** 258. In microorganisms in foods 6 ed. ICMSF 2005: 1-106.
10. Harakeh S, Yassine H, Gharos M, Barbour E, Hajjar S, El-faddel C, Toufelli I, Tannow R.: **Isolation, molecular characterization of antimicrobial resistance patterns of Salmonella and Escherichia coli isolates from meat based fast food in Lebanon**. Sci. Total Environ 2005, 341: 33 – 44.
11. International Standard ISO 6887-1: **Microbiology of food and animal feeding stuffs-Preparation of test samples, initial suspension and decimal dilutions for microbiological examination**. Part 1: In: General rules for the preparation of test samples, initial suspension and decimal dilutions.1999 : 1-5.
12. International Standard ISO/TS 16649-2: **Microbiology of food and animal feeding stuffs**. **Horizontal method for counting Escherichia coli β -glucuronidase-positive**. In: Counting technique colonies in the plate at 44˚C using 5-

bromo-4-chloro-3-indolyl β-glucuronide, 2003 : 1-8.

13. International Standard EN ISO 6579: **Microbiology of food and animal feeding stuffs.** In: Horizontal method for the detection of *Salmonella spp*., 2002, 2004 : 1-27.
14. Meldrum R.J, Smith R.M.M, Ellis P. and Garside J.: **Microbiological quality of randomly selected ready-to-eat foods sampled between 2003 and 2005 in Wales, UK.** International Journal of Food Microbiology, 2006, 108:397-400.
15. Wei QK, Hwang SHL and Chen TR.: **Microbiological quality of ready-to-eat food products in Southern Taiwan.** Journal of Food and Drug Analysis, 2006,14: 68-73.
16. Sachindra NM, Sakhare PZ, Yashoda KP, Narasimha Rao D.: **Microbial profile of buffalo sausage during processing and storage**. Food Control, 2005, 16: 31-35.
17. Soriano JM, Rico H, Molto JC and Manes J.: **Incidence of microbial flora in lettuce, meat and Spanish potato omelette from restaurants.** Food Microbiology, 2001, 18: 159-163.
18. Tivadar B.: **Save money, waste love, ambivalence toward purchased convenience food.** Annals, series Historia et Sociologia, 2003, 13 (1): 87-102.
19. Tsang O.: **Guidelines for ready-to-eat food.** Road and Environmental Hygiene Department, Hong Kong, 2002. 15 – 16.
20. Umoh VJ and Odoba MB**.: Safety and quality evaluation of street foods sold in Zaria, Nigeria**. Food Control, 1999, 10: 9–14.
21. World Health Organization (WHO).: **Health surveillance and management procedures for food handling personnel**. Technical Report 1989, Series, 785: 52