



GOOD HYGIENE PRACTICES AS AN IMPORTANT PROGRAM FOR SAFETY OF FINAL PRODUCTS

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Abstract: In order to meet the requirements regarding food safety, in addition to the HACCP system, food operators are required to adopt, implement and document Good Hygiene Practice (GMP), Good Manufacturing Practice (GMP), Standard Operating Procedures (SOP) and Standard Sanitary Operating Procedures (SSOP). Therefore, the purpose of our research was to determine the importance of implemented hygienic and manufacturing practices in the meat industry in the municipality of Prilep. Analysis of the sensory, physicochemical and microbiological parameters of water, as well as the presence of *Listeria monocytogenes* on the contact surface and in thin sausage (vacuum packed) was performed. The results of the water analysis show that it is safe and does not lead to additional contamination of sausages. In addition, the absence of *Listeria monocytogenes* is a result of well-established practices regarding the microbiological quality of sausages.

Keywords: GHP, GMP, security, sausage.

1. Introduction

Today's urbanization conditions, as well as global environmental pollution, make food safety a major global problem [1], while protecting food sources is imperative for protecting human health [2]. In the food sector the implementation of Good Hygiene Practice (GHP) and Good Manufacturing Practice (GMP) ensures the creation and maintenance of favorable production conditions [3], with the aim of improving the safety of the finished product [4].

Meat is a food that is an integral part of daily diet, but in well-developed countries its use is limited due to health risks [5], and because it easily becomes subject to microbial contamination [6]. The most important microbiological causes of meat contamination are: *Listeria monocytogenes*, *Clostridium botulinum*, *Salmonella* spp., *Escherichia coli* and

Yersinia enterocolitica [7]. *Listeria monocytogenes* is the only psychotropic anaerobic/ facultative anaerobic bacterium that causes contamination of thermally unprocessed meat and all processed meat products obtained from it, including ready-to-eat food [8].

2. Materials and methods

The research was conducted in a meat industry (facility for production of smoked meat products, meat preparations and minced meat) in the Prilep region for a period of one year. Samples were taken ones a month from contact surface (N=12), finished product (N=12) and water (N=12). The water tests included analyzes of sensory, physicochemical, and microbiological parameters. Samples of water were taken in glass sterile bottles. Chemical parameters pH (ISO 10523: 2012), nitrates (ISO 6777: 1993) and

ammonium ion (ISO 7393-3: 1990) were examined. Microbiological analysis of *E. coli* (ISO 9308-1), *Enterococci* (ISO 7899-2), *Pseudomonas aeruginosa* (ISO 16266) and total number of microorganisms at 22°C (ISO 6461-2) and at 37°C (ISO 6222) were performed. The methods used are in accordance with *Rulebook on Water Safety* (Official Gazette of the Republic of Macedonia no. 46/2008).

Analyzes for the presence of *Listeria monocytogenes* on the contact surface and in thin sausage (vacuum packed) were performed using the standard MAK EN ISO 11290-1.2 method. Representative samples for examination of the microbiological safety of the contact surface were taken from 50 cm² of contact surface. For sausages analysis were taken

five units (25 g) of one sample. For both analyzes the samples were placed in clean, sterile containers that provide adequate protection against further contamination.

3. Results and discussion

The quality of water must comply with the standards for safe drinking water, because can be an ingredient in many foods [9]. According to the results shown in table 1, it can be observed that the analyzed parameters are within the permissible limits in accordance with the approval with the authorization [10]. According to [11] the low values obtained for the presence of nitrates and residual chlorine are indicators of good water quality and the absence of pathogenic microorganisms (Table 1).

Table 1

Physicochemical and microbiological analysis of water

Parameters tested (N=12)	Results output	Permissible limits
pH	7.3	6.5-9.5
Nitrates (mg / L)	0.2	50
Chlorine (mg / L)	0.3	0.3-0.5
<i>E. coli</i>	0/100 ml	0/100 ml
<i>Enterococci</i>	0/250 ml	0/250 ml
<i>Pseudomonas aeruginosa</i>	0/250 ml	0/250 ml
Total number of microorganisms at 22 °C	5/1 ml	100/1 ml
Total number of microorganisms at 37 °C	0/20 ml	20/1 ml

The most important sensory parameters investigated in water are color, taste, and odor [12]. Accordingly, our results indicate that water meets the requirements for use in the food sector as there are no significant changes in it. Contact surfaces in food industry are particularly important as a potential source of contamination. The quality, durability and safety of meat

products largely depend on cleaning, washing, and disinfecting equipment and contact surfaces [13]. Specifically, if the equipment is contaminated with *Listeria monocytogenes* it may be the reason for sausage contamination as a final product during production [14].

Table 2

Results of the analyzed swabs of the contact surface (slides) and thin sausage (vacuum packed) for the presence of *L. monocytogenes*

Parameters tested (N=12)	Results output
<i>L. monocytogenes</i> in contact surface swabs	Negative
<i>L. monocytogenes</i> in thin sausage (vacuum packed)	Negative

The absence of *Listeria monocytogenes* from stainless steel equipment (Table 2) was determined; the results indicated a well-implemented GHP [15]. Starting from the fact that each meat industry is obliged to make a microbiological analysis on the presence of *Listeria monocytogenes* in the finished product in accordance with the marketing authorization [16], the contaminated meat products with this bacterium represent a serious public health hazard [7].

According to [8] the absence of *Listeria monocytogenes* in the final product is due to the effectiveness of the fermentation, maturation and drying of the products. Also, absence of *Listeria monocytogenes* from the equipment (Table 2) and appropriate application of the technological procedure decrease in the contamination rate [17].

Final products are likely to be contaminated with *Listeria monocytogenes* during storage time if hygienic conditions are unsatisfactory [18] which in turn constitutes a risk of production and sales losses.

4. Conclusion

In the context of the above results, it can be concluded that well-implemented GHP and GMP in the food industry result in the production of a safe product. In order to get a safe food product we must take care

of hygiene throughout the production process. In the case of deviations from the prescribed norms in accordance with the veterinary measures and controls for the protection of public health, a program of corrective action aimed at the introduction and implementation of corrective measures to eliminate the causes of non-compliance should be implemented.

5. References

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