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THE IMPACT OF THE HYGIENE IN THE SLAUGHTERHOUSE ON MICROBIOLOGICAL STATUS OF LAMB CARCASSES

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The consumption of a lamb meat in Macedonia has a periodical character, mostly during the Orthodox and Catholic Easter. The aim of this research is to evaluate the hygienic conditions in the slaughterhouses regarding microbiological safety of lamb carcasses, during the period of March and April 2018, in a region of Prilep. The microbiological contamination of lamb carcasses slaughtered on a slaughter line was measured by determination of a total number of aerobic mesophilic bacteria, Enterobacteriaceae and Salmonella spp. Five lamb carcasses were sampled from the slaughter line. All of the carcasses presented low count of investigated microorganisms. The total number of aerobic mesophilic bacteria and Enterobacteriaceae were mostly within satisfactory and acceptable categories. Salmonella spp. was not isolated from any of the lamb carcasses.

Key words: *lamb, carcasses, slaughterhouse, quality.*

Introduction and Literature overview

Globally, food-borne illness is a growing public health problem due to increased global food trade, changes in the way of food production and changes in consumer requirements [1). This model change is causing new challenges in the way of food safety management. About 75% of the new infectious diseases that have affected people in the past 10 years are caused by pathogens, which originate from animals or products of animal origin. The developing countries strive to increasingly stringent sanitary and phytosanitary standards in their export markets. In this way, they can maintain and improve access to the market, improve the domestic food security and productivity of agriculture by adopting a strategic approach to food safety, public health and commerce [2]. International organizations, such as the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), are engaged in the prevention and transmission of human diseases

through contaminated food and by improving hygienic production, processing and distribution. An important development is the establishment of a joint FAO / WHO Food Standards Program whose primary responsibility is to prepare the Codex Alimentarius, a collection of internationally adopted standards for food and food products. Codex Alimentarius Code of Hygienic Practice for Meat (CHPM) is the primary international standard for meat hygiene and includes a risk-based approach to the application of sanitary measures through the meat production chain [3].

Republic of Macedonia is known as lamb producer and exporter in the Member State of the European Union and in other countries. Every country, no matter whether it is a member of the European Union or not, requires implementation of certain standards in the process of slaughtering and processing of the lamb [4]. Slaughterhouses which export meat to the European Union subjected to inspection every year by veterinary inspection of the European Union as well as by the Agency for Food and Veterinary according to the Law for Veterinary, Official Gazette of Republic of Macedonia 113/2007 and the Public Health Law 114/2007.

Object, subject and methods of study

The study was done within a two month period in slaughterhouse in Prilep, R.Macedonia. The slaughterhouse had distinct areas for slaughtering, handling and cold storage of the meat. The processing of the carcasses is in a vertical position, method which is now applied in all slaughterhouses in the world. Cleaning, disinfection and rinsing of the whole equipment and all surfaces in the slaughterhouse is done after each slaughtering.

Samples for analysis were taken in accordance with the annual monitoring plan from contact surfaces, water and carcass.

Water samples were analyzed twice a year for physico-chemical and microbiological parameters. Wet swabs were taken from contact surfaces for total number of microorganisms (ISO 4833: 2003), followed by monitoring plan three times a year. Samples from five carcasses were collected during the period of an intense slaughtering in the slaughterhouse (March and April 2018). After bleeding, skinning and eviscerating processes, the carcasses were washed with pressurized chlorinated water, and then analyzed after final washing. Wet swabs were taken using non-destructive method for examining the presence of *Salmonella spp*. using an abrasive sponge (ISO 6579 – Horizontal method for the detection of *Salmonella spp*.). The destructive method was used for detection of *Enterobacteriacea* (ISO 21528-2: 2004) and aerobic colonies (ISO 4833: 2003).Samples were

transported in refrigerated containers (4° C) to the laboratory. Samples were cultured on the same day.

Results and discussion

From the Table below (Table 1 and Table 2), the physicochemical and microbiological parameters of water samples obtained from the slaughter-house are in agreement with regulations [5]. The presence of ammonia, nitrates and nitrites in the water can be an indicator of the presence of pathogenic microorganisms or poor water quality [6; 7], but in analyzed samples they are below the permissible value.

Table 1 – Physical-chemical parameters of water used in the slaughterhouse

Parameters	Results	Criteria	Method
Active acidity (pH)	7.38	6.8-8.5	ISO 10523:2012
NH_3	0.082mg/L	50 mg/L	ISO 6778:1984
Electroconductivity	259µS/cm	1000µS/cm	DIN Nom 10753
Residual chlorine	0.00mg/L	0.5 mg/L	ISO 7393-3:1990
Nitrates	2.18mg/L	50 mg/L	ISO 1890-3:1988
Nitrites	0.0024mg/L	0,10mg/L	ISO 6777:1993
Consumption of $KMnO_4$	1.18mg/L	8 mg/L	ISO 8467:1995
Chlorides	2.13mg/L	250 mg/L	ISO 9297:1989

Table 2 – Microbiological analysis of the water used in the slaughterhouse

Parameters	Results	Criteria	Methods
Pseudomonas aeruginosa	0 cfu/100ml	0 cfu/100ml	ISO 16266
Sulphide-reductive anaerobes	0 cfu/100ml	0 cfu/100ml	ISO 6461-2
Number of colonies at 22° C	0 cfu/ml	100/1ml	ISO 6222
Intestinal enterococci	0 cfu/100ml	0 cfu/100ml	ISO 7899-2
Coliform bacteria	0cfu/ml	0cfu/ml	ISO 9308-1
Number of colonies at 37° C	0 cfu/ml	20/1ml	ISO 6222
Escherichia coli	0 cfu/100ml	0 cfu/100ml	ISO 9308-1

As a result of well-established and implemented good practices like Good Hygienic Practice (GMP) and Good Manufacture Practice (GMP) aerobic mesophilic bacteria are in satisfactory level (Table 3) **[**3**]**.

Table 3 – Microbiological analysis of the swab from the contact surface

Parameter	Result	Criteria
Aerobic mesophilic bacteria at 30° C	0 cfu/cm^2	Satisfactory

Only healthy, clean and appropriately identified animals should be placed on the slaughter line in order to obtain quality and safety meat. Meat hygiene refers to the hygienic measures that can be taken during the processing steps in meat production [8). As a result of preventing transfer of zoonosis and pathogenic microorganism's animals and meat are under ante- and post- mortem inspection of veterinarians. According to our regulation in slaughter line, determination of the aerobic mesophilic bacteria, *Enterobacteriaceae* and Salmonella are required (Table 4 and 5). Results presented in Table 4 and Table 5, indicate that the lamb carcasses are microbiologically safe for public consumption, which means that hygiene in slaughterhouse is on satisfactory level.

Table 4 – Microbiological analysis of samples with non-destructive for *Salmonella spp*.

Number of samples	Parameter	Result	Criteria
5	Salmonella spp.	Negative	Satisfactory

Table 5 – Microbiological analysis of samples – destructive method

Parameters	Number of samples	Results	Criteria
Enterobacteriaceae	1	0 log cfu/cm^2	Satisfactory
	2	0 log cfu/cm^2	Satisfactory
	3	0 log cfu/cm^2	Satisfactory
	4	0 log cfu/cm^2	Satisfactory
	5	0 logcfu/cm^2	Satisfactory
Aerobic mesophilic bacteria at 30° C	1	1.4 log cfu/cm^2	Satisfactory
	2	1.2 log cfu/cm^2	Satisfactory
	3	1.1 log cfu/cm^2	Satisfactory
	4	1.2 log cfu/cm^2	Satisfactory
	5	1.4 log cfu/cm^2	Satisfactory

The presence of *Salmonella spp*. was examined from all five lamb carcasses. Salmonella spp. was not isolated from any of the examined samples. According to Martineli [9] *Salmonella* was not found in the sampled carcasses in local slaughterhouses. On the other hand in Spain [10] isolated this bacterium in 10% of freshly dressed lamb carcasses studied in samples collected from the neck, leg and flank regions. These authors suggested that the structure of the abattoirs and slaughtering practices may influence contamination with certain *Enterobacteriaceae*.

In Table 5 are presented microbiological results obtained with destructive method. In the literature, the ranges of reported results from aerobic mesophilic bacteria from sheep carcasses with non-destructive sampling are different. This is due as a result of applied different factors such as different sampling sites, treatment on the carcasses [11]. But, as a result of improved hygienic sanitary condition in the slaughterhouse such as adequate sterilization of knives and avoid contact between fleece and muscle surface [9].

The *Enterobacteriaceae* family includes 25 genera and more than 80 different species, including some pathogenic microorganisms. *Enterobacteriaceae* are constantly present in the environment and they are the most common contaminants on the slaughter line [12] and they can be used for routine method. Skinning, scalding, evisceration, dressing and carcass transport are common contamination points and if these steps are correlated with improper hygienic conditions they can contaminated the meat. The bacterial contamination of meat is not stopped after slaughtering. It is ongoing process during the operations, such as meat cutting and meat processing [13].

According to Bojkov [14] season of sampling had a significant influence on the results. In all four seasons the mean value for the total number of bacteria was $\leq$ 3.5 log cfu/cm^2. The highest value was recorded in March, April and May, and the lowest in December, January and February. The mean value for the content of *Enterobacteriaceae* was $\leq$ 1.5 log cfu/cm^2 and the highest was in September, October and November, and the lowest in December, January and February. *Salmonella* was not recorded in all seasons.

Conclusion

Results for the aerobic mesophilic bacteria, *Enterobacteriaceae* and *Salmonella spp.* shown that hygiene of slaughterhouse was at a satisfactory level. These results indicate that it is possible to obtain lamb carcasses which are microbiologically safe if the slaughterhouse follows the good practices as a GMP and GHP.

References

1. Abiodun J. Akinade (2015): Zoonotic diseases prevention and control: The role of awareness and educational programs.

2. A.Mantovani (1992): Zoonoses control and veterinary public health. Rev. sci. tech. Off. int. Epiz., 1992, 11 (1), 205–218.

3. Rayees Ahmed Bafanda, S. A. Khandi, Sheikh UmairMinhaj and Adil Masood Khateeb (2017): Meat Hygiene and Associated Health Hazards Awareness among Consumers of Jammu District of Jammu and Kashmir. Current Journal of Applied Science and Technology 23(3): 1–11, 2017; Article no.CJAST.36045.

4. Joshevska E., Spahija-Rakipi B., Stojanovski M., Tomovska J., Bojkovska K. and Dimitrovska G. (2014): Specificity in the processing of Macedonian lamb meat to the member states of the European Union and third countries. IJISET, Vol. 1 Issue 10, December 2014. ISSN 2348-7968.

5. Official Gazette of the Republic of Macedonia No. 26 (2008).

6. World Health Organisation (2001): Parameters of water quality. Environmental Protection Agency, Ireland.

7. Fadiran A. O. and S. M. Mammba (2004): Analysis of nitrates and nitrites in some water and factory effluent samples from some cities in Swaziland. Bull. Chem. Soc. Ethipo. 2005, 19(1), 35–44.

8. Code of hygienic practice for meat CAC/RCP 58-2005.

9. Thais Mioto Martineli, Oswaldo Durival Rossi Junior, NatchaDeboniCereser, MaritaVedovelli Cardozo, CristianneLinoFontoura and Silvia Helena VenturoliPerri (2009): Microbiological counting in lamb carcasses from an abattoir in Sao Paulo, Brazil. Cienicia Rural, Santa Maria, v. 39, n. 6, p. 1836–1841, set, 2009 ISSN 0103-8478.

10. Sierra, M-L. (1995b) Prevalence of *Salmonella*,*Yersinia, Aeromonas, Campylobacter*, and cold growing *Escherichia coli*on freshly dressed lamb carcasses. Journal of Food Protection, Ames, v. 58, n. 11, p. 1183–1185.

11. ZWEIFEL, C.; STEPHAN, R. Microbiological monitoring ofsheep carcass contamination in three swiss abattoirs. Journalof Food Protection, Ames, v. 66, n. 6, p. 946–952, 2003.

12. Snezana Ivanovic, Ksenija Nesic, Boris Pisinov and Ivan Pavlovic (2015): The microbal status of carcasses of goats slaughtered in an inadequate facility. International 58th Meat Industry Conference “Meat Safety and Qualitu: Where it goes?”. Procedia Food Science, 5(2005), 109–112.

13. Rani, Z. T., Hugo A., Hugo C.J., Vimiso P., Muchenje V., (2017): Effect of post-slaughter handling during distribution on microbiological quality and safety of meat in the formal and informal sectors of South Africa: A review. *S. Afr. j. Anim. Sci.* [online], vol. 47, n. 3, pp. 255–267.

14. Bojkov Goran (2012). Implementation of system for food safety in high risk (abattoir) industry. Master thesis. University Goce Delcev, Agricultural Faculty, Stip, R. Macedonia.