The Establish of the Coliforms/cm^2 on the Area of Cattle Carcass Air Drying

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Abstract

Coliforms present in 1 cm^2 of carcass surface shows the degree of contamination during slaughtering as well as the hygienic condition of the air, the slaughtering hall, the equipment getting in contact with the carcasses, of the utensils, operators' work equipment, of the operators' hygiene. The indicator is determined by inoculating microorganisms from the carcasses surface in nutritional and selective environments, followed by their placing under heat control and counting of the microorganisms.

Keywords: *operational sanitation, coliforms, slaughtering, carcasses*

INTRODUCTION

The operational sanitation consists in a number of work procedures and measures included in the SSOP, which must ensure the obtaining of food products not contaminated with pathogen microorganisms or alteration microorganisms, or a number of microorganisms as small as possible. In order to achieve that goal, during the obtaining and processing of the products, the work technology and hygiene must be complied to during the entire production technology flow (Regulations for application in food industry units standard procedure for sanitation (SSOP), 1998).

a. Determinations performed: determination of coliforms CB/cm^2 for each carcass.

b. Frequency and moment of performing: samples were taken from 5-10 carcasses, during one single day of each week.

MATERIALS AND METHODS

From the carcasses, after the toilet and before starting the cooling process, 4 samples off tissue were taken, representing a total surface of 20 cm^2. The 4 fragments were obtained by cutting out with a sterile device of lambouri in area of 5 cm^2 and maximum 5 mm thick (a rectangle with the dimensions of 2,5 cm/2 cm) from the election areas, which were introduced in aseptic conditions, right after sample taking, in a vessel or sterile plastic bag, and then shipped to the lab.

The samples were taken from the following election points: neck, chest, side and thigh.

The samples were taken through the destructive method. Samples were taken from 5-10 carcasses, in one single day of each working week. The sample taking was made at the end of one slaughtering day's program, before the cooling process. Before examination, samples taken from the 4 election points were put together. Until the moment of examination, the samples were kept at a temperature of 4°C. The examination was performed after no mote than 24 hours from sample taking.

The samples taken were diluted in a stomacher bag, with 100 ml peptone saline solution (0,1% peptone + 0,85% NaCl), were subject to homogenization, using a peristaltic stomacher, for at least 2 min. in 250 rpm.

For the processing, serial dilutions were made in peptone saline solution (0,1% peptone + 0,85% NaCl). The suspension resulted from the meat homogenization in the stomacher bag was not considered as a dilution, and in the calculation it

was considered to have a dilution of 10^0 (Tibulca, D., 2006).

Determinations were made for the setting of the coliforms bacteria, according to the European standard SR ISO 4832/2009, Microbiology of food and animal feeding stuffs. Horizontal method for the enumeration of coliforms. Colony-count technique.

Two poured plates are prepared using a solid selective culture medium (crystal violet neutral red bile lactose – VRBL – agar), with a specified quantity of the test sample. Other pairs of poured plates are prepared under the same conditions, using decimal dilutions of the test sample. The plates are incubated at 30°C or 37°C (as agreed) for 24 h.

The characteristic colonies are counted and, if required, a number of colonies are confirmed by fermentation of lactose (confirmation medium – brilliant green lactose broth).

The number of coliforms per mililitre of sample is calculated from the number of characteristic colonies obtained in the plates chosen (Microbiology of food and animal feeding stuffs. Horizontal method for the enumeration of coliforms. Colony-count technique, 2009).

According to the work protocol samples were taken in order to set the total number of coliforms CB/cm^2 of carcass surface in 2 cattle slaughtering units.

The sample taking was made in the time 2009-2010. The samples were taken simultaneously in the 2 units.

Following experimental versions were set through work protocol:

Witness Versions:

- Vm: A_b, B – the disinfection was made with NaOH 2.5% sol.

Experimental Versions:

- V_{e1}: A_b, B – the disinfection was made with sol. of Decontaminol 1%;
- V_{e1}: A_b - the disinfection was made with sol. of Decontaminol 1% and the HACCP plan was implemented;
- V_{e2}: B - the disinfection was made with sol. of Decontaminol 1% and for the sanitation-decontamination a specially trained team was used.

RESULTS AND DISCUSSIONS

The coliforms CB/cm^2 for each carcass in cattle slaughtering, after the air drying operation in the witness versions V_mA_b and V_mB has presented average values of 48.33 and a variability coefficient of 50.14% for the entire experimental period in the unit A and 62.33 in unit B with the variability coefficient of 51.12%.

Total coliforms CB/cm^2 for each carcass in cattle slaughtering, after the air drying operation in the $V_{e1}A_b$ experimental version presented average value of 50.50 and a variability coefficient of 60.14% for the entire experimental period in the unit A. In the unit B, in the experimental version $V_{e1}B$ average values were 47.31 and the variability coefficient 59.14%

Total coliforms CB/cm^2 for each carcass in cattle slaughtering, after the air drying operation in the experimental versions $V_{e2}A_b$ and $V_{e2}B$ decreased to 40.00 and a variability coefficient of 26.15% for the entire experimental period in unit A and 43.00 into the unit B with the variability coefficient of 58.19%.

In unit A statistically very significant differences ($p < 0.001$) were noticed between the total coliforms CB/cm^2 for each carcass, after the air drying operation, between the experimental versions $V_{e1}A_b$ and $V_{e2}A_b$, statistically significant ($p<0.01$) between V_mA_b and $V_{e2}A_b$ and statistically insignificant ($p>0.05$) between V_mA_b and $V_{e1}A_b$.

In unit B statistically very significant differences ($p < 0,001$) were noticed between the total coliforms CB/cm^2 for each carcass, after the air drying operation, between the experimental versions V_mB and $V_{e1}B$ as well as between V_mB and $V_{e2}B$. Between $V_{e1}B$ and $V_{e2}B$ the differences were statistically insignificant ($p>0.05$). This is shown in *Fig. 1.*

The efficiency of the procedures and of the experimental means was assessed for the optimization of the sanitation, though two indicators:

- The degree of reducing of CB/cm^2 for each carcass in the studied experimental versions;
- The percentage rate of the *acceptable, margin and inappropriate* samples, from the total of examined samples.

Both indicators considered show favorable results in the experimental versions, as follows:

The degree of reducing NTG/cm² for each carcass in the experimental versions studied is presented in *Table 1*.

Analyzing the information in *Table 2* it can be found that the microbe load of the carcass surfaces has recorded average values oscillating between 48 and 40 cfu/cm² carcass surface in unit A and between 62 and 43 ufc/cm² carcass surface in unit B.

After disinfecting the work surfaces with solution of Decontaminol 1%, following data were found:

- In unit A the average values of CB/cm² for each carcass surface were between 48 and 50.5 cfu/cm². The logarithm values of the absolute average values have oscillated between 1.68 and 1.7.
- In unit B the average values of CB/cm² for each carcass surface were 62 and 47 cfu/cm², the degree of bacterial reducing being of 24.1%. The logarithm values of the absolute average values have oscillated between 1.79 and 1.67.

After replacing the decontamination means and the use of new sanitation optimization procedures following was found:

- In unit A the average values of CB/cm² per carcass were included between 48 and 40 cfu/cm² carcass surface, the degree of bacterial reducing being of 17.2%. The logarithm value for the absolute average values was of 1.6.

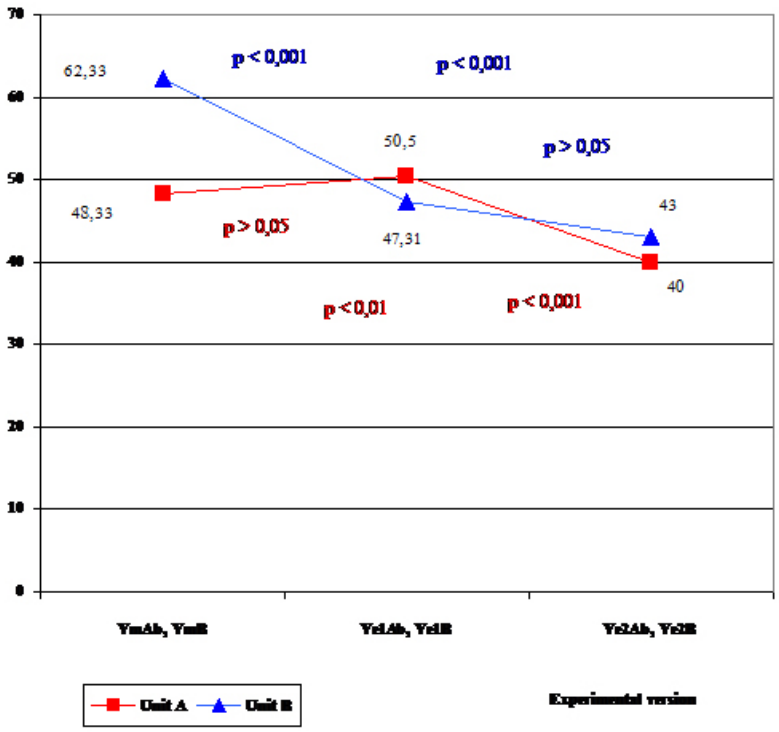

Fig. 1 . The evolution of CB/cm² by area of cattle carcass within unities A and B during experimental period

Table 1. Degree of reducing CB/cm² of surface at cattle slaughter

Crt. no	Checked objective	Experimental version		Degree of reducing, %	Experimental version		Degree of reducing, %
		V_mA_b	$V_{e1}A_b$		V_mB	$V_{e1}B$	
1.	Cattle semi-carcasses	48.33	50.5	-	62.33	47.31	**24.1**
		V_mA_b	$V_{e2}A_b$		V_mB	$V_{e2}B$	
		48.33	40	**17.2**	62.33	43	**31**

Table 2. Number, share, respectively (%) of not corresponding samples from total of examined samples when CB/cm^2 of surface was determined (cattle slaughter)

Version	Unit A			Unit B		
	Acceptable values	Margin values	Non-acceptable values	Acceptable values	Margin values	Non-acceptable values
V_m	18 **(39.2%)**	25 **(54.3%)**	3 **(6.5%)**	16 **(34.8%)**	26 **(56.5%)**	4 **(8.7%)**
V_{e1}	31 **(66%)**	15 **(31.9)**	1 **(2.1%)**	28 **(59.6%)**	16 **(34%)**	3 **(6.4%)**
V_{e2}	28 **(80%)**	7 **(20%)**	-	27 **(77.1%)**	7 **(20%)**	1 **(2.9%)**

- In unit B the average values of CB/cm^2 for each carcass were between 62 and 43 ufc/cm^2 carcass surface, the degree of bacterial reducing being of 31%. The logarithm value of the absolute average values have been of 1.63.

The second criterion discussed, ***the number of acceptable samples, margin samples and non-acceptable samples,*** respective, their ***percentage rate*** in the total of examined samples in the experimental versions studied is a much objective and representative criterion. Their values are presented in *Table 2*.

For the bacteriologic examination of the carcass surfaces, 128 samples of lambouri were taken in unit A as well as in unit B.

After replacing the decontamination means and using new procedures for the optimization of sanitation, following situation was found:

- In unit A, the number of acceptable samples was in continuous growth, being of 18 (39.2%) within the witness versions (V_mA_b), of 31 (66%) in the experimental version $V_{e1}A_b$ and of 28 (80%) in the experimental version $V_{e2}A_b$. The number of margin samples has decreased continuously being of 25 (54.3%) within the witness version (V_mA_b), of 15 (31,9%) in the experimental version $V_{e1}A_b$ and of 7 (20%) in the experimental version $V_{e2}A_b$. The number of non-acceptable samples was in continuous decrease, being of 3 (6.5%) within the witness versions (V_mA_b), of 1 (2.1%) in the experimental version $V_{e1}A_b$ and no samples in the experimental version $V_{e2}A_b$.
- In unit B, the number of acceptable samples was in continuous growth, being of 16 (34.8%) within the witness versions (V_mB), of 28 (59.6%) in the experimental version V_{e1}B and of 27 (77.1%) in the experimental version V_{e2}B. The number of margin samples has decreased continuously being of 26 (56,5%) within the witness versions (V_mB), of 16 (34%) in the experimental version V_{e1}B and of 7 (20%) in the experimental version V_{e2}B. The number of non-acceptable samples was in continuous decrease being of 4 (8,7%) within the witness versions (V_mB), of 3 (6,4%) in the experimental version V_{e1}B and of 1 (2,9%) in the experimental version V_{e2}B.

CONCLUSIONS

In *cattle slaughtering,* for the bacteriologic control of the surfaces of carcasses regarding CB/cm^2 for each carcass, a number of 128 samples of carcass lambouri were taken and analyzed, from unit A as well as from unit B. The evaluation has shown the following:

In the control CB/cm^2 of carcass, by replacing the disinfection means and the use of a new optimization procedure for the sanitation, the number of acceptable samples has grown from **39.2%** to **80%** in unit A and from **34.8%** to **77.1%** in unit B, the number of margin samples has decreased from **54.3%** to **20%** in unit A and from **56.5%** to **20%** in unit B and the number of non/acceptable samples has decreased from **6,5%** to **0%** in unit A and from **8,7%** to **2,9%** in unit B.

After replacing the disinfection means and using new procedures for the optimization of sanitation, the degree of bacteriologic reducing of the average values of CB/cm^2 of surface of cattle carcass surface was of **17.2%** in unit A, respective of **31%** in unit B.

Analyzing the data obtained at the microbiological examination of the microaeroflora and of the work surfaces, utensils, equipment, personnel, it is found that there is a strong connection between

the pre-operational hygiene and the carcasses state of contamination. Thus, it was noticed that when the pre-operational hygiene was poor, the degree of contamination of the carcasses was high, denoting the fact that that in the contamination of the carcasses the air of the working spaces and the degree of contamination in the work surfaces has had a contribution too.

The presence of coliform bacteria on the surfaces of carcasses indicates a poor pre-operational hygiene, the contaminations occurring during various technological operations and due the personnel's state of hygiene or cross contaminations.

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