

## INTRODUCTION

The hygienic dressing of rabbit carcasses in the slaughterhouse is a key element to prevent meat contamination resulting from poor hygienic practices or cross-contamination between clean and unclean areas. Strict monitoring of animal welfare conditions and proper animal handling are quite important to reduce the generation of stress in pre-slaughter operations and therefore facilitate the reduction of microbial growth of pathogenic germs on carcasses.

The monitoring of hygienic slaughter can be verified by microbiological control of the processes through monitoring of indicator microorganisms. Regulation 2073/2005 sets legal limits for ruminant and porcine carcasses, but it is not established for lagomorphs.

## OBJECTIVE

The objective was to compare the levels of microbial contamination in different locations of rabbit carcasses sampled in a small production slaughterhouse.

## MATERIAL AND METHODS

Four sampling sessions were carried out (19/01/2018, 14/02/2018, 5/03/2018 and 19/03/2018) analysing five randomly selected carcasses using the non-destructive method to determine mesophilic aerobic bacteria and Enterobacteriaceae was carried out (Table n°1). The samples were obtained by swabbing with a sterile 0.85% NaCl solution, in areas of 20 cm<sup>2</sup> in neck, thigh, back and belly location with the use of a template and rubbing for 5 seconds in three different directions.

For non-destructive sampling for Salmonella, an abrasive sponge was used and rubbed in three directions and added to a tube containing 40 ml of sterile saline solution. Forty surface samples for mesophilic aerobes (tryptone soy agar TSA) and Enterobacteriaceae (MacConkey agar) and five samples for Salmonella (brilliant green agar) were streaked for 48-72 hours at 37°C.

Table 1. Dates of experiment and sampling procedures.

Date	Start time	End time	Nº of animals in batch	Average dressing time	Sampling order of rabbit carcasses
1 (29/01/2018)	8:53	10:15	130	37.85 sec	1 (30), 2 (33), 3 (63), 4 (79), 5 (90). A (123), B (16), C (47), D (91), E (125).
2 (14/02/2018)	7:43	9:30	120	53.5 sec	6 (1), 7 (61), 8 (78), 9 (89), 10 (91). F (36), G (59), H (64), I (87), J (106).
3 (05/03/2018)	7:45	9:21	130	44.31 sec	11 (2), 12 (32), 13 (41), 14 (76), 15 (108). K (20), L (36), M (43), N (80), O (117).
4 (19/03/2018)	8:30	9:45	125	36 sec	16 (1), 17 (43), 18 (62), 19 (70), 20 (91). P (28), Q (45), R (67), S (73), T (94).

Numbers: process hygiene sampling criterion.

Letters: food safety sampling criterion.

## RESULTS AND DISCUSSION

The highest mean values of mesophilic aerobic bacteria and Enterobacteriaceae were found in the neck (77.95 & 3.4125 CFU/cm<sup>2</sup>), belly (22.006 & 0.9725 CFU /cm<sup>2</sup>), thigh (10.14 & 0.5612 CFU /cm<sup>2</sup>) and back (6.15 & 0.4325 CFU /cm<sup>2</sup>) (Tables n° 2 and 3).

The ANOVA analysis of variance allowed to determine statistically significant differences ( $\alpha=0.05$ ) between neck with respect to the thigh and back (Figures n° 1 and 2). Regarding to Salmonella, the presence of bacteria was not detected in the samples analysed.

Microbiological criteria for rabbits' carcasses are proposed (Table n° 4).

Table n° 2. Total daily average.

Date	Aerobic bacteria CFU/cm <sup>2</sup>	Enterobacteriaceae CFU/cm <sup>2</sup>
1 (29/1)	17.0038	0.066
2 (14/2)	58.8925	3.47625
3 (5/3)	32.99125	1.17875
4 (19/3)	7.365	0.6575

Table n° 3. Total microorganisms per carcass

Carcass	Mesophilic aerobic bacteria CFU/cm <sup>2</sup>	Enterobacteriaceae CFU/cm <sup>2</sup>
1	3.1125	0.0625
2	46.6625	0.08125
3	19.60625	0.05
4	4.9375	0.13125
5	10.7	0.00625
6	5.9875	0.04375
7	80.58125	14.74375
8	10.85625	0.325
9	20.7875	0.5875
10	176.25	1.68125
11	146.3	4.2
12	3.89375	0.4625
13	5.1875	0.5375
14	3.44375	0.23125
15	6.13125	0.4625
16	6.1625	0.2875
17	9.75	2.00625
18	6.55	0.34375
19	7.9375	0.425
20	6.425	0.225

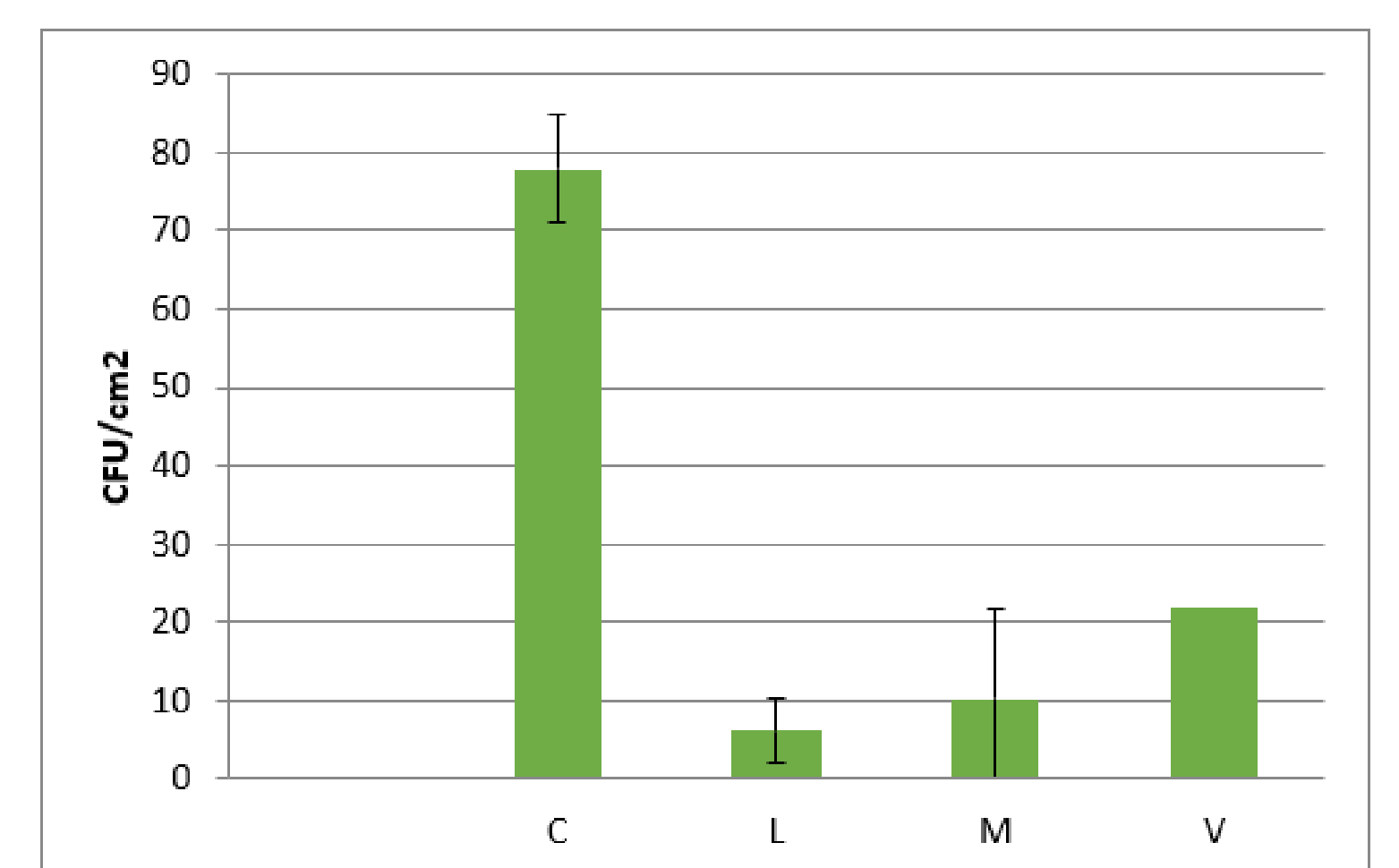


Figure n° 1. Total average of mesophilic aerobic by location.

Locations: C (neck), L (back), M (leg) and V (belly).

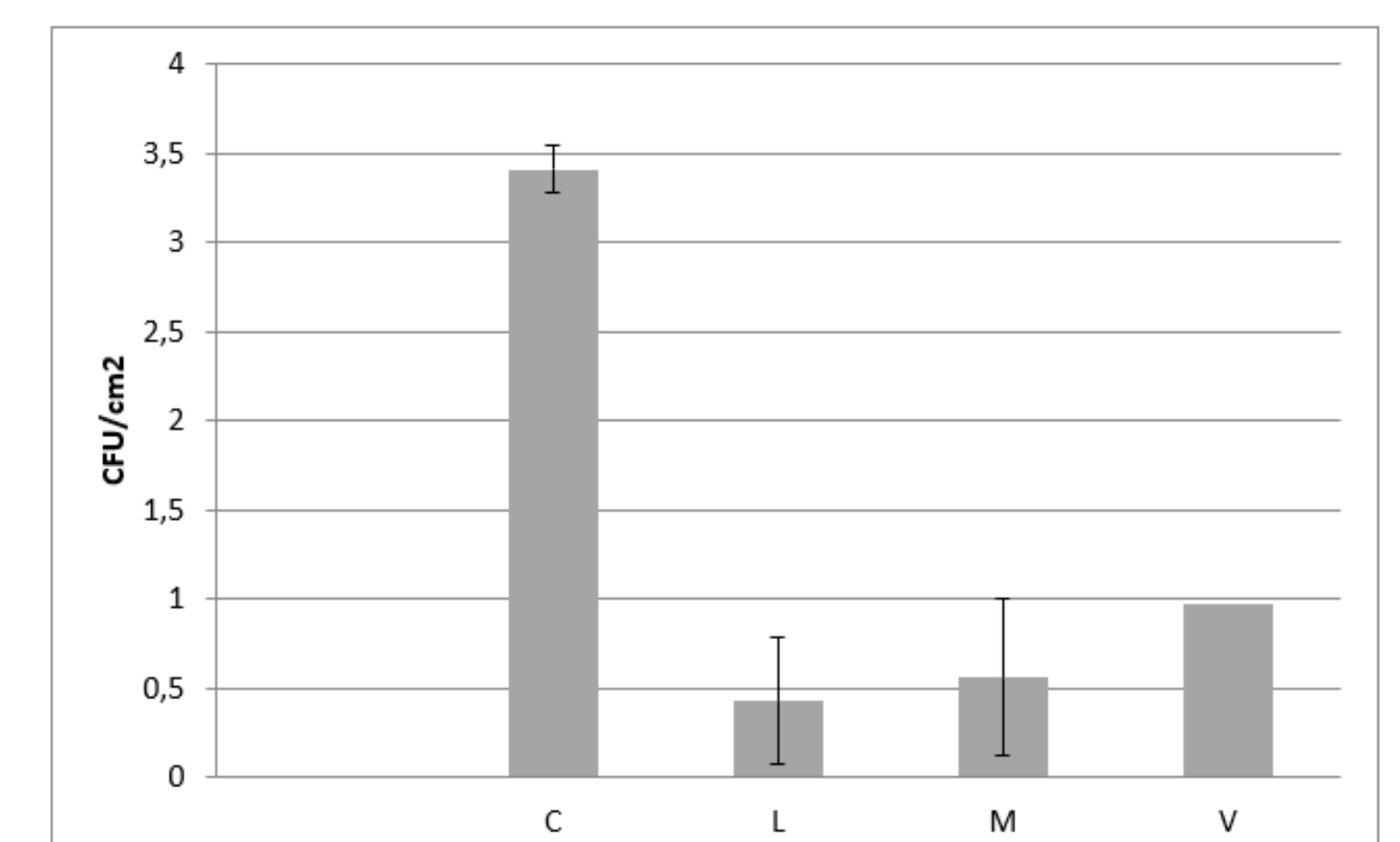


Figure n° 2. Total average of enterobacteriaceae by location.

Locations: C (neck), L (back), M (leg) and V (belly).

Table n° 4. Proposal of microbiology criteria for carcasses

Proposal for process hygiene criteria.							
Food category	Micro-organisms	Sampling plan		Limits		Analytical reference method	Stage where the criterion applies
		n	c	m	M		
Carcasses of lagomorphs	Aerobic colony count			2.0 log CFU/cm <sup>2</sup> daily mean log	4.5 log CFU/cm <sup>2</sup> daily mean log	ISO 4833	Carcasses after dressing but before chilling
	Enterobacteriaceae			0.5 log CFU/cm <sup>2</sup> daily mean log	2.0 log CFU/cm <sup>2</sup> daily mean log	ISO 21528-2	
Proposal for food safety criteria.							
Food category	Micro-organisms	Sampling plan		Limits		Analytical reference method	Stage where the criterion applies
		n	c	m	M		
Lagomorphs meat	Salmonella typhimurium Salmonella enteritidis	5	0	Absence in 25 grams		EN/ISO 6579	Products placed on the market during their shelf-life

## CONCLUSIONS

Consequently, it can be concluded that neck, belly and thigh are the places of choice for sampling rabbit carcasses in the estimation of contamination by mesophilic aerobic bacteria and Enterobacteriaceae as hygienic criteria for slaughter processes.

