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THE INFLUENCE OF REFRIGERATION ON *SALMONELLA*

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Abstract

This study aimed to analyse the influence of refrigeration on Salmonella.Two register strains have been used – S. Enteritidis (D) (ATCC 13076) and S. Typhimurium (ATCC14028), each having a known load of $28*10^7$, respectively $40*10^7$. The two strains have been subjected to temperature variations as such: 1.-18°C for 1 h 45 min; 2. 2-4°C for 6 h after the first stage; 3. 2°C for 10 h after the second stage.The collected samples have been analyzed according to ISO 6579:2002. The results have shown that after quick refrigeration (-18°C for 1 h 45 min), the S. enteritidis and S. typhimurium microorganisms at the load of 22 log ufc/cm^2, respectively 44 log ufc/cm^2 could not be noticed. The other two variations (2-4°C for 6 h and 2°C for 10 h) did not have any effect on the two Salmonella strains, no matter the UFC number used. We can affirm that the temperature of-18°C prevent the multiplication of microorganisms only if the microbial load is reduced, and once with increasing temperature the microorganisms have been highlighted.

Key words: *multiplication, refrigeration, Salmonella, strains, temperature.*

INTRODUCTION

Refrigerated semicarcasses are kept at a temperature of 4°C, under which circumstances *Salmonella* spp. does not multiply itself (Bolton et al., 2002).

Most producers begin to process the refrigerated carcass the next day after slaughter, in order to allow the carcass to reach a temperature of 7°C, by subjecting it to refrigeration for 14 to 16 h. All the studies on refrigeration show a decrease in the number of microorganisms (Greer and Dilts, 1998). Gill and Landers (2004) discovered that refrigeration reduced the presence of *E. coli*, but not the number of aerobic germs found on the carcasses. Variations of the cooling of carcasses depend on intrinsic causes (weight of carcass, how thick the fat layer is, the initial temperature of the carcass) and on extrinsical causes (temperature, air speed, relative humidity, distance between carcasses) (Sheridan, 2000).

Spescha et al. (2006) evaluated in a study the effect of refrigeration on carcasses in two slaughter houses in the EU. The results refer exclusively on refrigeration, not on a combination of treatments (application of organic acids). The authors observed a reduction in the total number of aerobic germs and in the number of *Enterobacteriaceae* as a result of refrigeration. A reduction by one log of the number of aerobic mesophilic germs has been noticed, excepting the cervical area. It is possible for the residual waste water on the surface of the carcasses to lead to contamination of the surface of the neck with pathogen agents. It is also possible for the refrigeration and drying process to be less effective because of low air movement from pavement.

The study on risk evaluation conducted by Delhalle et al. (2008) established that 15 to 24 h were needed to obtain an inner temperature of 7°C of the carcass. The time of refrigeration affects the total number of germs, but the medium raise was only of 0.005 log UFC cm^2, so its influence was low.

Mafu et al. (1989) observed an increase in the presence of *Salmonella* spp. (12,5%) on the pavement in the refrigeration area. The increase was caused by activities of the staff. Therefore, the staff's hygiene and discipline is important in the reduction of contamination during refrigeration of carcasses.

MATERIALS AND METHODS

Two register strains have been used – *S. enteritidis* (D) (ATCC 13076) and *S. typhimurium* (ATCC14028), each having a

known load of $28*10^7$, respectively $40*10^7$. The two strains have been subjected to temperature variations as such:-18°C for 1 h 45 min; 2-4°C for 6 h after quick refrigeration; 2°C for 10 h after quick refrigeration.

The methods used are presented in the following: (Table 1). Samples were analysed according to ISO 6579:2002.

Table 1. The methods used

Strains	Load	Sampling hour		
S. enteritidis	$28*10^7$	1h 45 min	6 h	10h
	$14*10^7$			
	$28*10^6$			
	$28*10^2$			
	28 ufc/cm^2			
S. typhimurium	$40*10^7$	1h 45 min	6 h	10h
	$20*10^7$			
	$40*10^6$			
	$40*10^2$			
	40 ufc/cm^2			

RESULTS AND DISCUSSIONS

The analysis performed on the collected samples revealed the following results:

Following the fast refrigeration process (maintaining the carcasses at a temperature of-18°C for 1h 45 min), no microorganisms could be noticed on the samples having a load of 28 ufc/cm^2, respectively 40 ufc/cm^2. This result was obtained because the load was low, as well as the temperature. Therefore, the two strains of *Salmonella* could not multiply themselves.

After the next step of the refrigeration, at a temperature of 4°C and after 6, respectively 10 h after the firs and second stage, the samples revealed microbial load. The fact that the samples tested positive is caused by the high load of germs reported to the surface. Such values are not usually found on the surface of the carcass. The samples did not test positive at a low load of 28 ufc/cm^2 respectively 40 ufc/cm^2 after fast cooling because of its′ numerical effect.

Carcasses according to demands can be obtained by respecting hygiene and specific slaughter procedures by the staff.

CONCLUSIONS

The temperature of-18°C during 1h 45 min prevent evidence of *S. enteritidis* and *S. typhimurium* strains.

A microbial load whose value exceeds two ciphres increases the occurrence of the disease.

REFERENCES

Bolton D.J., Pearce R.A., Sheridan J.J., Blair I.S., McDowell D.A., Harrington, D., 2002. Washing and chilling as critical control points in pork slaughter hazard analysis and critical control point (HACCP) systems. Journal of Applied Microbiology, 92, 893-902.

Delhalle L., De Sadeleer L., Bollaerts K., Farnir F., Saegerman C., Korsak N., Dewulf J., De Zutter L., Daube G., 2008. Risk Factors for Salmonella and Hygiene Indicators in the 10 Largest Belgian Pig Slaughterhouses. Journal of Food Protection, 71, 1320-1329.

Greer G.G., Dilts B.D., 1988. Bacteriology and retail case life of spray-chilled pork. Canadian Institute of Food Science and Technology Journal, 21, 295-299.

Gill C.O., Landers C., 2004. Proximate sources of bacteria on boneless loins prepared from routinely processed and detained carcasses at a pork packing plant. International Journal of Food Microbiology, 97, 171-178.

Mafu A.A., Higgins R., Nadeau M., Cousineau G., 1989. The incidence of Salmonella, Campylobacter, and Yersinia enterocolitica in swine carcasses and the slaughterhouse environment. Journal of Food Protection, 52, 642-645.

Sheridan J.J., 2000. Monitoring CCPs in HACCP systems. In: Brown M., (Eds) HACCP in the meat industry CRC Press, Boca Raton, 203-230.

Spescha C., Stephan R, Zweifel, C., 2006. Microbiological contamination of pig carcasses at different stages of slaughter in two European Union-approved abattoirs. Journal of Food Protection, 69, 2568-2575.

***ISO 6579: 2002. General guidance on methods for the detection of Salmonella. International Organization for Standardization, Geneve, Switzerland.