EFFECTS OF THE CRYOGENIC CHILLING OF PORK CARCASSES ON THE MICROBIOLOGICAL QUALITY OF THE MEAT

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INTRODUCTION

In a pig abattoir even if hygienic parameters are well observed,it is sometimes difficult to get a carcass with safety levels of surface contamination. Pig carcasses are frequently scalded in hot water and this treatment; can be a critical point of contamination.

The cold storage at refrigeration temperatures (near 0ºC) is normally, used as an auxiliary operation. It is necessary to consider, that the carcass temperature after bleeding is near 40ºC, due to metabolic activities and when hot boning technique is employed superficial contamination could increases quickly. On the other hand, cryogenic chilling can be used after hot boning to minimize this problem.

The present investigation was undertaken to determine the effect of the cryogenic chilling at -45ºC and -30ºC on the pork carcasses and its effects on the microbiological quality of the meat. Total Coliforms Counts and Total Mesophilic Counts were used to evaluate contamination during the processing of the carcasses and meat plant hygienic conditions.

MATERIAL AND METHODS

The experimental work was developed in the pilot plant of the Meat Technology Center located in Campinas, São Paulo State, Brazil. Nine female animals, Landrace and Large White, were utilized in this study. Three treatments were compared: (a) cryogenic chilling at -30ºC (b) cryogenic chilling at -45ºC and (c) conventional chilling at 2º to 4ºC during 22 hours. Cryogenic chilling (a and b) reached -2ºC on meat cuts loin and ham after 40 and 60 minutes, respectively.

A swab technique was used for microbiological evaluation purpose following the methodology contained in VANDERZANT *et al* (1992). Psychotropic Total Count, Total Coliform Count and *Salmonella* sp were determined in the vacuum packed meat cuts stored at 0ºC during 8 days.

RESULTS AND DISCUSSION

The results presented in Table 1 show that the hot boning counts were higher for Mesophilic populations when compared with cold boning although all levels were considered low (10 to 10^3 CFU/cm^2), showing good processing conditions. According to OREFICE *et al* (1988) hot boning requires more manipulation at room temperatures than cold boning resulting in an increase of the initial surface contamination of the carcasses.The Total Coliform Counts showed no difference between two types of boning and in both techniques.There were a very low levels of this microorganisms (10^1 to < 10 CFU/cm^2). Mc NAMARA (1995), UPTON (1995) and BRYAN (1980) reported that microbiological tests such as Mesophilic and Coliform, Total Counts are good parameters to describe the process and plant conditions.

According to the present work,cryogenic treatments at -30ºC and -45ºC, were equally efficient to reduce the initial levels of microbiological population (< 10 CFU/cm^2). As the studied microorganisms are mesophilic, both chilling treatments could lead to thermal injury.

Considering the cryogenic and conventional treatments after 8 days of storage at 0ºC (Table 2) it was observed that all of them showed equal efficiency after this period of storage,whith very low levels of indicator organisms (Psichrotopic and to Total Coliforms) were found (< 10 CFU (cm^2).

Table 2 also shows that no *Salmonella* sp were detected in any of the samples examined.

CONCLUSIONS

The results obtained in this study lead to the following conclusions:

1. There was no difference between chilling techniques related to the microbiological quality of pork meat. Both treatments reduced equally the initial carcass contamination.
2. The killing process was done under good hygienic conditions since the indicator organisms populations were very low.
3. After the storage conditions employed (-30ºC, -45ºC and conventional) the chilling treatments investigated were equally efficient.

Table 1. Mesophilic Total Count and Total Coliform Count in pork carcasses after chilling treatments.*

Chilling Treatments	Sample Region of the carcasses	Total Mesophilic Count (CFU/cm²) **				Total Coliform Count (CFU/cm²)**			
		Initial Level	After Scalding	After Boning	After Chilling	Initial Level	After Scalding	After Boning	After Chilling
Quick Freezing at -30°C	Loin	2.0×10^2	1.0×10^2	1.8×10^3	< 10	< 10	< 10	10×10^1	< 10
	Ham	9.4×10^2	< 10	6.0×10^1	< 10	1.1×10^1	1.5×10^1	1.0×10^1	< 10
Quick Freezing at -45°C	Loin	3.2×10^2	1.4×10^2	1.5×10^2	< 10	1.8×10^1	1.4×10^1	1.4×10^1	< 10
	Ham	1.0×10^3	1.3×10^1	1.4×10^2	<10	3.0×10^1	3.2×10^1	1.5×10^1	< 10
Conventional	Loin	2.4×10^2	2.1×10^2	3.3×10^2	-***	1.6×10^1	1.0×10^1	< 10	-***
	Ham	5.5×10^1	1.0×10^1	1.7×10^1	-***	< 10	< 10	< 10	-***

* Arithmetic average of three repetitions
** CFU/cm² = Colony Form Unites per square centimeter
*** Not determined (Conventional)

Table 2. Indicators microorganisms and *Salmonella* sp in pork meat cuts, after 8 days at 0°C.*

Muscle	Treatment	Psychotropic Total Count (CFU/cm²)	*Salmonella* sp (25g)
Loin	A	< 10	absent
Loin	B	<10	absent
Loin	C	< 10	absent
Ham	A	<10	absent
Ham	B	< 10	absent
Ham	C	<10	absent

A = Cryogenic Chilling at -30°C
B = Cryogenic Chilling at -45°C
C = Conventional
* Average of three repititions

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