

BACTERIOLOGICAL QUALITY OF NOT FULLY EQUALIZED CARCASSES AND SEMI-HOT PROCESSED CUTS AFTER TRANSPORTATION

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INTRODUCTION

A number of Danish bacon factories are interested in transport of carcasses and cuts between geographically separated departments of an individual plant before the meat temperature is fully equalized between deep and superficial parts after chilling.

The purpose is to be able to carry out cutting and deboning of pigs on the day of slaughter even if these processes are carried out in a department geographically separated from the slaughter plant. This necessitates the transport to take place before equalization of the temperature of the chilled carcasses and cuts is finalized. Another reason for the demand for this transport method can be lack of chilling capacity in the plant.

According to EEC regulations transport of carcasses and cuts between geographically separated departments is not permitted until the temperature in all parts of the meat is below +7°C.

Therefore, in order to be able to exploit the advantages offered by the form of production outlined above it is necessary to obtain dispensation from, or to update the prevailing regulations. In connection with the efforts to obtain this, transport experiments with not fully equalized carcasses and semi-hot processed cuts have been carried out.

MATERIALS AND METHODS

Investigations of the bacteriological quality after transport of not equalized half carcasses and semi-hot processed fore-ends, middles and hind legs have been carried out. In the investigations the semi-hot processed cuts and not equalized half carcasses have been directly compared with the same cuts and half carcasses from a production produced according to the traditional procedure.

The experiments have been carried out four times for each type of cuts and half carcasses. Test batches and control batches were taken out on four different days of slaughter.

Using the semi-hot processing technique the cutting was carried out on the day of slaughter, before the centre temperature of the various parts of the carcasses had come down to +7°C.

By passing through the chilling tunnel the carcasses are pre-chilled, after this the carcasses are kept under controlled conditions for a short period to obtain some equalization of the temperature. Immediately after this period the carcasses are ready for cutting.

Slaughter Line

The killing and dressing is carried out in the traditional way. The carcass weights are within the limit of 57-74 kg.

Immediately before passage through the chilling tunnel the pigs are sorted. Over a period of 1-2 hours two times 20-30 pigs are marked for test batch and control batch, respectively. Test pigs and control pigs are selected in turns all through the marking period. The pigs are uniform as far as classification is concerned.

Pre-chilling

The carcasses are chilled in a blast tunnel according to the usual "chilling in tunnels" programme. The air temperature in the tunnel is in the range of -20°C to -25°C and the passage of the tunnel takes approx. 60 minutes.

Equalization

Some equalization of the temperature is necessary before cutting can take place. The equalization takes place in refrigerated rooms with air circulation at 2-3°C, for the test batches usually for a period of 1-4 hours, while the equalization time for the control batch is approx. 24 hours.

Transport

The transport takes place in refrigerated vans with an air temperature of 2-4°C. The time of transport is typically 1-2 hours.

Chilling Rooms at Arrival

On arrival to the other plant the half carcasses and cuts are placed in chilling rooms at a temperature of 2-5°C.

Temperature Registrations

Temperature control of the carcasses is performed by measuring the centre temperature of ham, loin and fore-end of the test batches and control batches, respectively.

The measurements take place after the chilling tunnel approx. 1 hour after arrival in the equalization rooms and during sampling for bacteriological analyses in the chilling room after transport the day after slaughter.

Bacteriological Analyses

Samples are taken for bacteriological analyses from 13-18 carcasses among the test and control batches. The first sampling takes place when the carcasses have hung in the equalization rooms for approx. 1 hour and the second when test as well as control batches have been placed in the chilling rooms after transport the day after slaughter.

The samples are taken from test pigs and control pigs, alternatively corresponding to the sequence in which they are selected at the sorting. The samples are taken from right and left halves, alternatively and from the same halves from which the temperature registrations are made.

In investigation of the bacteriological quality of not equalized half carcasses the samples are taken from five different places of the carcass: three from the meat side and two from the rind side. While by investigation of the bacteriological quality of semi-hot processed fore-ends, middles and hind legs the samples are taken from three different places: two from the rind side and one from the meat side (fore-ends and hind legs) or one from the rind side and two from the meat side (middles).

The sampling procedure is the following: A limited area (10 cm²) is wiped with a humid and afterwards with a dry swab which are then pre-treated together.

The swabs are collected in a plastic bag and 10 ml dilution fluid is added (0,9% salt solution + 0.1% pepton). The content of the bag is treated in a stomacher for approx. 30 seconds whereafter dilution series and plating are made.

The bacteriological analyses included:

- Total bacterial counts (PCA, deep inoculation, 20°C, 5-6 days and nights)
- Faecal streptococci (Slanetz agar, surface inoculation, 37°C, 2-4 days and nights).

RESULTS

The results of the temperature registrations on carcasses in the equalization room approx. 1 hour after passage through the chilling tunnel and transport the day after slaughter are shown in Table 1.

The lower limits of the temperature intervals in Table 1 state the lowest registered centre temperature during the experiments, while the upper limits state the highest registered centre temperatures.

As it appears from the registrations the centre temperatures of half carcasses and cuts at any point of the meat are below +7°C the day after slaughter in the test as well as in the control batches.

Our investigations show that transport of not fully equalized carcasses and semi-hot processed cuts causes no rise of temperature.

The bacteriological results from the analyses for total bacterial counts of half carcasses, fore-ends and hind legs after transport the day after slaughter are stated in figure 1-3.

As expected the total bacterial counts and numbers of faecal streptococci found in the linked test and control batches are of the same size when sampled in the equalization rooms.

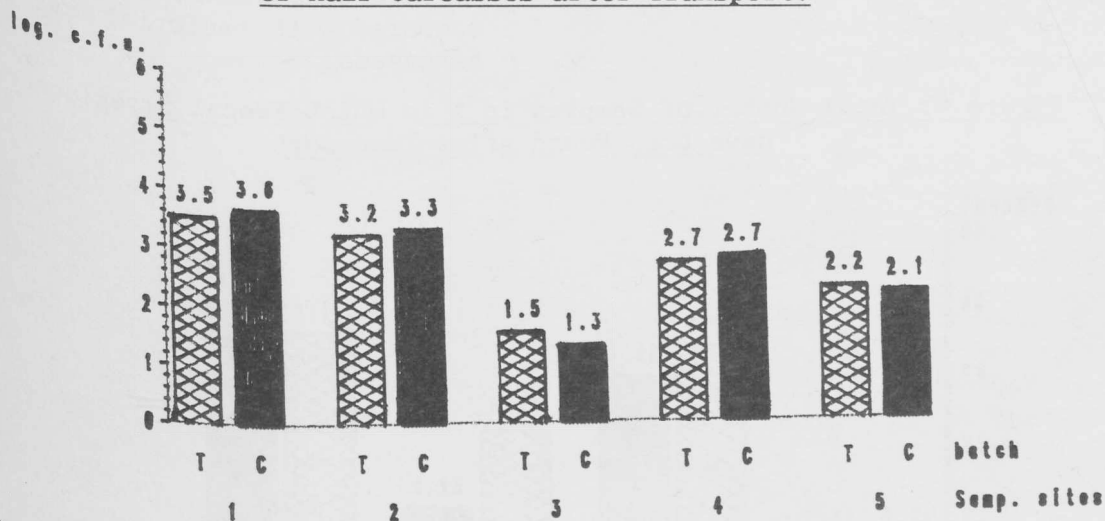
Tables 1: Centre Temperatures (°C)

		Measuring Place	Test Batch	Control Batch
After chilling tunnel	1/2 CARCASSES	Ham	26.0-37.7	26.5-39.2
		Loin	9.6-25.2	11.1-22.5
		Fore-end	16.6-34.5	12.6-34.5
After transportation the day after slaughter	1/2 CARCASSES	Ham	5.3- 6.2	3.5- 4.7
		Loin	4.2- 5.3	2.9- 4.2
		Fore-end	4.5- 5.5	3.3- 4.3
	CUTS	Ham	1.6- 4.6	4.1- 7.6
		Loin	3.5- 4.9	3.3- 5.5
		Fore-end	4.6- 6.9	4.7- 7.0

As it appears from figure 1 the total bacterial counts of half carcasses are on an acceptable level and the total bacterial counts found in the linked test and control batches are of the same size. An analysis of variance of the results confirm that there is no significant difference in total bacterial counts between the test and control batches analysed after transport of half carcasses.

The bacterial counts of hind legs are higher, but still on an acceptable level compared with bacterial counts of half carcasses. As it appears from figure 2, the level of bacterial counts of hind legs are found to be of the same size for the linked test and control batches.

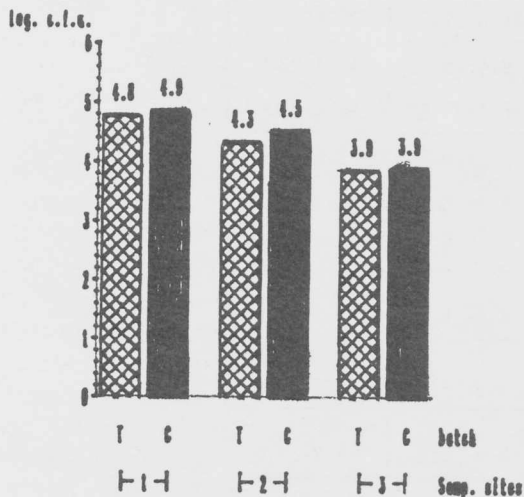
Figure 1: Total Bacterial Counts (log. Colony Forming Units/cm²) of Half Carcasses after Transport.



Sampling sites:

1. Fore knuckle, rind side
 2. Knee, rind side
 3. Front ribs, meat side
 4. At sternum, meat side
 5. Behind ball of the femur bone, meat side
- T = test C = Control

Figure 2: Total bacterial counts (log. colony forming units/cm²) of hind legs after transport.



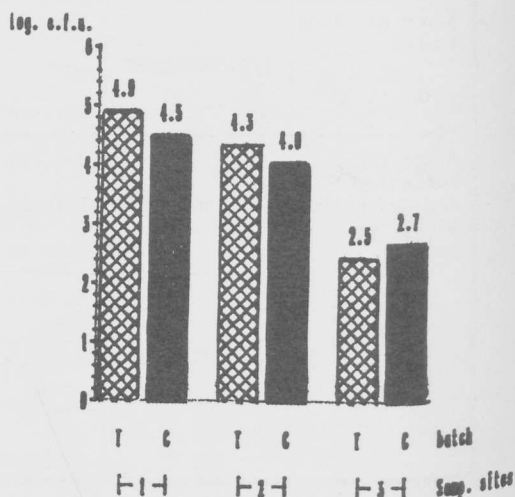
Sampling sites:

1. Knee, rind side
2. Top round near groin, rind side
3. Behind ball of the femur bone, meat side

Batch: T = test C = Control

The bacteriological results from analyses for total bacterial counts of middles after transport the day after slaughter are not shown, but the bacterial counts are on an acceptable level and as for hind legs the total bacterial counts found in the linked test and control batches are of the same size.

Figure 3: Total bacterial counts (log. colony forming units/cm²) of fore-ends after transport



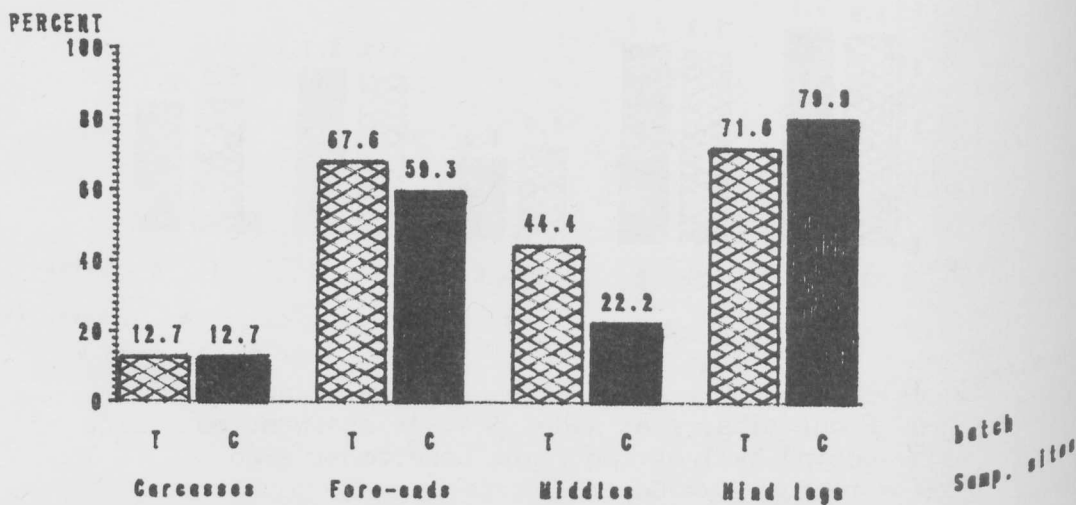
Sampling sites:

1. Fore knuckle, rind side
2. Collar, rind side
3. The front ribs, meat side

Batch: T = test C = Control

Figure 3 shows the total bacterial counts for investigation of the fore-ends after transport the day after slaughter. The bacterial counts of the sampling sites of the rind sides of the test batches are significantly higher than the linked counts of the control batches. But still the bacterial counts of fore-ends are on an acceptable level compared with bacterial counts of hind legs.

Figure 4: Total Number of Samples in % in Which Faecal Streptococci have been Found after Transport



Batch: T = test C = Control

Samples in which faecal streptococci have been found, i.e. samples with 10 or more than 10 faecal streptococci per cm².

Besides the analyses of total bacterial counts the bacteriological examinations did also include analyses for faecal streptococci.

As it appears from figure 4 the number of samples from half carcasses, in which faecal streptococci have been proved, is relatively low after transport and no difference has been found between the test and control batch. The number of faecal streptococci is in all cases below 100 cm², which is acceptable.

The number of samples in which faecal streptococci have been proved is bigger for cuts than for half carcasses. For fore-ends and middles the number is highest in the test batches, while for hind legs it is highest in the control batches. But still the number of faecal streptococci from samples of middles is in all cases below 100 cm². However, only the majority of number of faecal streptococci is below 100 cm² for hind legs and fore-ends, but still this is acceptable.

CONCLUSION

The temperature registrations showed, that the centre temperature of not fully equalized carcasses and semi-hot processed cuts the day after slaughter and transport at any point of the meat was below +7°C. The results also showed that temperature did not rise during transport.

The bacteriological examinations showed, that the total bacterial counts were on an acceptable level in not fully equalized carcasses as well as in semi-hot processed cuts after transport the day after slaughter and that the total bacterial counts found in the linked test and control batches for the major part of the cases were of the same size. Only for sampling sites on the rind side of fore-ends the bacteriological counts of the test batches were significantly higher than the linked counts from the control batches. This difference could be explained as difference between the slaughterhouses involved, with respect to pre-chilling and equalization time before cutting and transport of the test batches.

The number of samples in which faecal streptococci were found was low and of equal size for same test and control batch of half carcasses after transport. Furthermore, the number of faecal streptococci per cm² in the samples was on an acceptable level in all cases.

The number of samples in which faecal streptococci were proved was bigger for cuts than for half carcasses after transport and furthermore the results indicated that the number was bigger for test than for control batches. But still the number of faecal streptococci proved in samples from middles was below 100 per cm² in all cases, while for hind legs and fore-ends the majority of the number was below 100 per cm², but still this is acceptable.

The results indicated that transport of not fully equalized carcasses and semi-hot processed cuts was possible without causing reduced bacteriological quality.

REFERENCES:

- Juncker D. (1987):
Production Experiments with Transportation of Half Pig Carcasses where the Temperature is not Fully Equalized after Chilling.
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