MICROBIOLOGICAL CONDITIONS OF SHEEP CARCASSES FROM HIGH-CAPACITY SLAUGHTERHOUSE: A PRELIMINARY STUDY.

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Background

A rigorous attention in the practice of slaughtering is, in meat production, of crucial importance in the prevention of the microbiological contamination of the carcasses aimed to assure both meat quality and safety of public health. In order to allow the risk assessment in question and the determination of the measures to be taken, the slaughtering process analysis must be completed by collecting specific control data of the slaughter house on the microbiological condition of the carcasses. The ovine slaughtering shows some features, compared to other species, that condition the initial level of carcasses contamination and of meat derived from them, such as the presence of critical process stages (removal of the fleece).
The Committee Decision 2001/47/ECC of 8 June 2001, "which lays down rules for regular controls on general hygienic conditions carried out by the operators in the factories, according to the EEC rule 64 433 on health conditions for the production and circulation of fresh meat and according to EEC rule 71 118 related to health problems in fresh meat exchanges of yard birds", established guidelines for microbiological controls in slaughter houses on the basis of HACCP methods.

Objectives

The purpose of this study has been the microbiological monitoring of adult ovine and lambs carcasses and of processing surface (Total Viable Count-TVC, *Enterobacteriaceae*-EC and detection of *Salmonella*, *E.Coli O157*, *Listeria monocytogenes*), in five high-capacity slaughterhouses of Abruzzo and Molise.

Materials and methods

In five high-capacity slaughterhouses (named 1,2,3,4,5), the processing hygienic conditions of 30 ovine carcasses (10 adult and 20 lambs) have been estimated.
In adult ovines, on each side of the carcass, samples have been collected with the swabbing method on the following sampling sites: flank, thorax lateral, brisket and breast, using a 100 cm^2 template.
The difference, regarding 2001/471/EEC Decision, is in testing in different way the fore side and back side. The four swabs of the fore side (brisket and breast), dipped in 50 ml of Maximum Recovery Diluent-MRD (Oxoid), have formed a single sample; and the procedure was the same for the back side (flank and thorax lateral).
For lambs the non-destructive method has been always used. There was one sampling site for each shoulder and thigh of both sides of every carcass, using template of 25 cm^2, as stated in 2001/471/EEC Decision.
In this case too the difference, related to the original 2001/471/EEC Decision, is in testing apart the fore side and the back side.
The four swabs of the fore side, dipped in 50 ml of MRD, were a single sample; and the procedure was the same for the back side. The samples, transported to laboratory in sterile way at the temperature of +4°C, have been immediately analyzed.
For the TVC and *Enterobacteriaceae*, the methods foreseen in the 2001/471/EEC Decision have been applied. The presence of the pathogenic microorganisms (*Salmonella, E.coli O157, Listeria monocytogenes*) has been analyzed by sponge-bag (PBI International).
Each sponge, rehydrated with 10 ml of MRD, has been scoured on the entire carcass and transported at refrigeration temperature to laboratory, adding 90 ml of the same diluent. After they have been homogenised with peristaltic Stomaker, pre-enrichment, enrichment and VIDAS screening have been carried out.
Salmonella: according to the official method AFNOR V08-052; AFNOR BIO 12/10-09/02.
Listeria monocytogenes: according to the official method AFNOR BIO 12/9-07/02.
E. coli O157: according to the official method AFNOR BIO 12/8-07100.

All suspected colonies from selective media were screened and identified by biochemical systems (API-Biomerieux).
Regarding surfaces, the samples have been performed after cleaning and sanitization operations and however immediately before operation starts. In case of visible dirt, cleaning should be considered as unacceptable without any further microbiological evaluation. For wet areas dry cotton swabs have been used. Samples have been collected with cotton swabs moistened with 1 ml of diluent, as reported in 2001/4717ECC Decision, from a surface area of 20 cm^2.
According to the Decision TVC and *Enterobacteriaceae* concentrations have been assessed.
The presence of *Salmonella*, *Listeria monocytogenes*and *E.coli O157* have been evaluated as previously reported.
Statistical analysis: colony count results were transformed into log values and depicted in box plots. The mean values, obtained by the set of samples coming from fore and back side, were analysed by the variance analysis (ANOVA) and regression analysis.

Results and discussion

The histogram reported in Fig. 1 and related to TVC values, shows the behaviour of mean values as a function of the two sampling sites.
The statistical analysis, carried out for TVC, shows that no statistical difference is visible among the different slaughterhouses, adult ovine and lambs and the mean values of surface and carcasses. The medium values of the fore side and back side instead, showed a positive coefficient of regression, but due to the low number of sample and presence of some anomalous data, the correlation coefficient is not very high (0,56).
The higher contaminated side was the back. In literature, it has been reported that bacterial count on carcasses processed according to the conventional dressing, show the back side as the most contaminated area, moreover the areas of highest contamination are the sites where cuts are made through the skin (Bell et al., 1993; Bell et al., 1996; Vanderlinde et al., 1999).
All of the TVC mean values are within the acceptable range of the 471/2001/ECC Decision (<3,5 log ufc/cm^2) like those described in literature on ovine carcasses, after sampling with non-destructive method (Gill et al., 1998; Vanderlinde et al., 1999; Duffy et al., 2001; Phillips et al., 2001; Hedges et al., 2002; Reid et al., 2002; Mazzette et al., 2003; Zweifel et al., 2003).
The TVC values were always higher than the other species, particularly equine and bovine (Vergara et al., 2002; Sarli et al., 2003; Splendiani et al., 2003; Reid et al., 2003). This results have been explained by the presence of the fleece, which is the most important factor of contamination. Hadley et al. (1997) have observed that carcasses derived from ovine with dirty fleeces have been shown to carry up to 1000 times more microorganisms than carcasses derived from visually cleaner animals. Moreover the lower values of TVC found in the bovine, are due to the fact that large areas of the beef carcass surface are not touched by workers and their equipments, whereas the surface of smaller sheep carcass is handled or touched by equipment during dressing (Gill et al., 1998).
The levels of *Enterobacteriaceae* was not detectable as already found in previous surveys (Colavita et al., 2003; Splendiani et al., 2003).
All the examined carcasses showed negative results regarding *Salmonella, Listeria monocytogenes* and *E.coli O157.*
Regarding surfaces (Fig. 2), in three of the five plants, although the optimal microbiological values of carcasses, the reported values over the terms of acceptability show difficulty in correct SSOPs management (sanitation standard operating procedures) carried out by workers.

Conclusions

Our findings show that the back side has a highest microbial contamination because its area is more manipulated during the dressing.
The lack of the correspondence between the mean values of carcasses and surfaces, evidences the necessity of a better management of sanitization operations. As the hygienic peculiarities of the working environment have a basic role in food industries, it could be useful that the plant is degraded in class A, for a single unacceptable finding.

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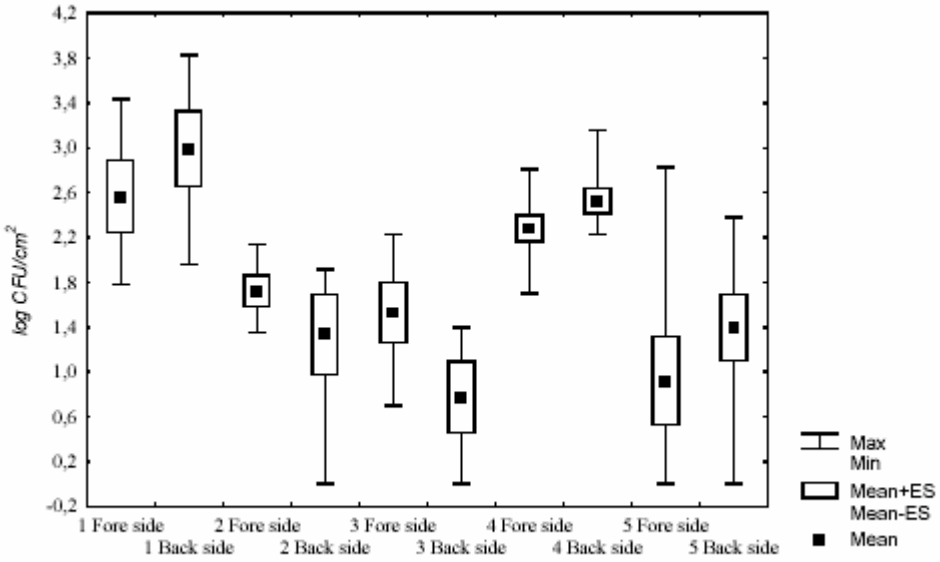

Fig. 1 show the TVC mean values of fore and back side in the five slaughterhouses.

Slaughterhouse	Acceptable range 0-10/cm^2	Unacceptable >10/cm^2
1	X	
2	X	
3		X
4		X
5		X

Fig. 2 show the result of surfaces value in the five slaughterhouse in according to Decision 2001/471/ECC