MICROBIOLOGICAL QUALITY OF CHILLED BEEF CARCASSES IN NORTHERN IRELAND:A BASELINE SURVEY

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BACKGROUND

The need for a low initial microbial load on carcasses (Nortjé and Naudé 1981) to allow for a reasonable shelf-life (7-9 days) on subsequent retail cuts, has suggested the necessity to monitor carcass condition. Formerly this was done by visual methods, however the association of meat with foodborne diseases has given rise to the necessity for microbiological assessments. Carcasses may be assessed destructively or non-destructively and many of these methods have been described in literature (Favero et al. 1968; Davidson et al. 1978; Sheridan and Lynch 1979; Gill and Bryant 1992). The former methods are expected to give higher and less variable counts, (Lazarus et al. 1977; Davidson et al. 1978; Anderson et al. 1987), however their destructive nature, the expense and the limitations of the sampling area, made them unsuitable for use in this study given that samples were to be collected from commercial facilities. Therefore an alternative non-destructive method was devised. Dorsa et al. (1997) showed that the level of difference between excision and swabbing with sponges is consistent, making sponges a practicable sampling method for estimation of aerobic bacterial populations on beef carcasses.

A sponge-swab technique (Murray and Madden, 1996) was developed and applied to carcasses in seven of the nine EU approved abattoirs in Northern Ireland (NI).

OBJECTIVES

Determine the baseline microbiological quality of chilled beef carcasses 24 to 48 hours post-kill (minimum 12 hours chilling), in the principal NI abattoirs.

MATERIALS AND METHODS

Preparation of Swabs

Spontex Sponges (Spontex Ltd., Swansea, Wales) were prepared by cutting into 8 by 9 cm sections and washed in a domestic washing machine on the rinse cycle. The sections were then laid on a flat surface and allowed to dry overnight at room temperature. Buffered peptone water (5ml) (BPW), was added to each sponge in a stomacher bag (Seward stomacher '400' bag) and the bag heat sealed (Hulme-Martin heat sealer, London, England) and sterilised by gamma irradiation (25kGy). Swabs were kept refrigerated (2^{0}C) until required and were not prepared more than two weeks in advance.

Sampling

Seven of the principal NI abattoirs were visited on three occasions, and 20 swabs were collected at each visit. This gave a total of 60 swabs collected for each abattoir and 420 swabs for the complete survey.

Swabbing of carcasses

At each visit, 20 carcasses were selected at random (the "leading" and "trailing" sides of a carcass should have an equal chance of being selected) and the brisket swabbed. An area on the brisket of approximately 1000cm^2 was marked by "dimpling" with a plastic ruler: measurements taken by locating the elbow and drawing an imaginary line medially to the mid-line, which was the starting point. Measuring 50cm up the mid-line, then 20cm laterally, then 50cm down and 20cm medially to complete the swab.

The stomacher bag was opened along the top with scissors (sanitised with a Medi-Wipe™ each time), the swab removed from the bag and the area firmly rubbed, approximately 20 times in the horizontal position and 20 times in the vertical position, using both sides of the swab. The swab was then placed back into the bag and sealed with tape for return to the laboratory under refrigerated transport. Sterile medical gloves (Aladan Corp., Dothan, AL, USA), were worn for sampling (taking care not to touch anything but the carcass, ruler and swabs).and changed between each carcass. The plastic ruler was sanitised each time with a Medi-Wipe™ (Smith & Nephew Medical Ltd., Hull, England).

Microbiological analyses

On return to the laboratory (within three hours of sampling), bags were opened by removing the tape and BPW (95 ml) added. Swabs were homogenised (Seward stomacher 400) on high power for two minutes. The swab was then manually squeezed through the bag and expressed liquid decanted into 100ml sterile Schott bottles, taking care not to wet the sponge again. After serial dilution in maximum recovery diluent (MRD), each sample was plated in quadruplicate onto Nutrient agar (NA); Malt Extract agar plus chloramphenicol (MEA + C) and Violet Red Bile Glucose agar (VRBG). Duplicate plates were incubated at 37^{0}C and 22°C for 48 hours, and characteristic colonies counted.

RESULTS AND DISCUSSION

Two temperatures of incubation were used to ensure recovery of microorganisms from both environmental (at 22^{0}C)and animal (at 37^{0}C) sources. For valid comparisons, data had to be derived from a significant point in the process which is common to all abattoirs sampled, hence carcasses were sampled after a minimum 12 hours chilling, the end point of slaughter and dressing. Abattoirs are referred to by a letter, as total anonymity had to be guaranteed. The average log TVC values (n = 60) were all within a narrow range of approximately one log cycle (Fig. 1) and contamination appeared to be roughly the same from environmental and animal sources, apart from abattoir F, where environmental contamination was about half a log cycle greater. Yeasts were present in lower numbers than the TVC's (Fig. 2) and appeared to arise mainly from environmental sources, except for abattoir E, where the two temperatures of incubation gave approximately equal results. Both moulds

and Enterobacteriaceae were only present at very low levels i.e. below 1 cfu/cm^2, the latter indicating no faecal contamination. Expressed as Log cfu/cm^2 the mean results for n = 420 were: TVC 3.23 @ 22^{0}C and 3.14 @ 37^{0}C; yeasts 1.12 @ 22^{0}C and 0.46 @ 37^{0}C.

CONCLUSIONS

A swab prepared from a domestic sponge, appeared to be a cheap and effective method for microbiological analyses of chilled beef carcasses. When this method was applied to 420 carcasses in seven of the principle abattoirs in NI, the carcasses were shown to be of good microbiological quality.

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Fig 1. Average Log total viable count for 1000cm^2 area of chilled beef carcass brisket swabbed at seven Northern Ireland abattoirs

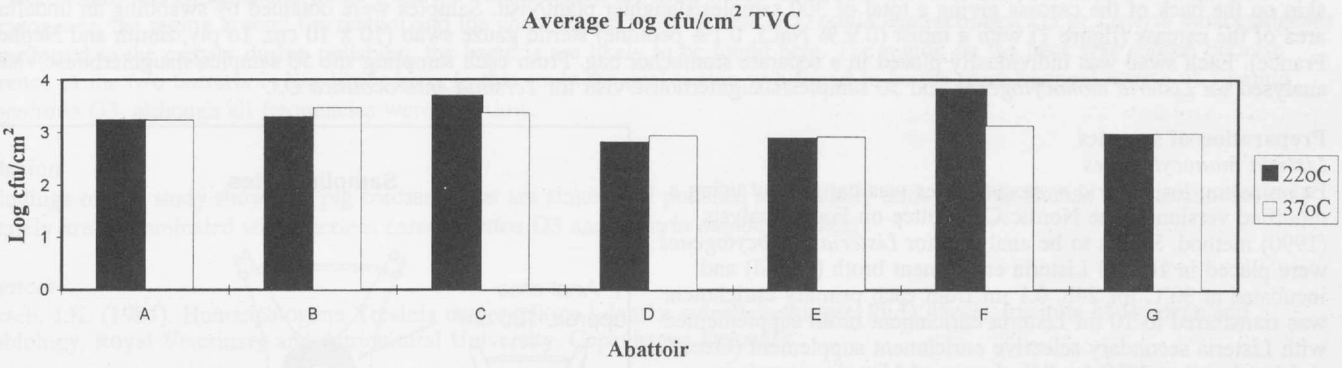

Fig. 2. Average Log yeast count for 1000cm^2 area of chilled beef carcass brisket swabbed at seven Northern Ireland abattoirs