

COMPULSORY HACCP AND ITS EFFECT ON CARCASS AND ENVIRONMENTAL SURFACE BACTERIAL INDICATOR NUMBERS IN UK RED MEAT SLAUGHTERHOUSES

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Keywords:

Carcass; Slaughterhouse; Environmental surfaces; Microbiology, HACCP.

Abstract:

Statutory microbiological test results were collected from UK meat plants over a 4 year period from June 2002 to May 2006. In total, 49,074 bacterial test results from 19,409 bovine, 14,706 ovine and 14,959 porcine carcass swabs were obtained. In addition, 90,288 environmental surface swab test results were collected.

These test results were donated by 94 slaughterhouses which process more than 66% of the UK's national annual throughput for red meat carcasses. The data were collectively analysed to determine any historical trends for total aerobes and the *Enterobacteriaceae*.

Significant reductions were observed in the numbers of both indicators on all the carcasses for all three species between 2002 and 2006. Reductions in bacterial numbers were also observed for environmental and food contact surfaces.

Introduction:

In keeping with an international trend of using a system to control hazards for meat processing, EU Commission Directive EC/471/2001 specified that all European meat slaughterhouses were to operate according to the seven HACCP principles specified by the Codex Alimentarius Commission (Anon, 1999). Verification that the slaughter and dressing processes were under control was to be undertaken in red meat plants by the weekly determination of microbial indicator numbers on carcasses. The cleanliness of environmental surfaces was also assessed by periodic testing before the start of processing. Both sets of tests are undertaken in a highly standardised manner. Four years worth of standardised bacterial indicator test results have been collected directly from 94 UK slaughterhouses and this poster presents details of how numbers of these indicators have changed over that period.

Methods:

Laboratory test result certificates were collected from participating plants. The information on the test certificates was manually typed into a SQL server database. The information entered into the database was checked for keying errors.

Log bacterial numbers were used for all analyses. Where results were reported as below the limit of detection of the test method, a value of half the limit of detection was substituted to enable a log transformation to be undertaken. t-Tests and ANOVA were used to determine statistical significance. For all tests, a P value of <0.05 was used for significance. Percentile summaries of datasets were calculated using Excel 2000 (Microsoft).

Results:

Table 1. The number of commercial slaughterhouse test results collected each year for cattle, sheep and pig carcasses and environmental surfaces. The numbers of plants that supplied these results each year or part of the year are shown in parenthesis.

Year	Number test results collected (number of plants)			
	Cattle	Sheep	Pig	Environmental Surfaces
June 2002 to May 2003	6,699 (36)	5,309 (31)	5,205 (35)	29,379 (81)
June 2003 to May 2004	5,917 (34)	4,252 (33)	3,947 (34)	31,706 (72)
June 2004 to May 2005	4,185 (33)	3,103 (28)	3,321 (33)	16,242 (71)
June 2005 to May 2006	2,608 (31)	2,042 (28)	2,486 (30)	12,961 (65)
Total	19,409	14,706	14,959	90,288

Results (continued):

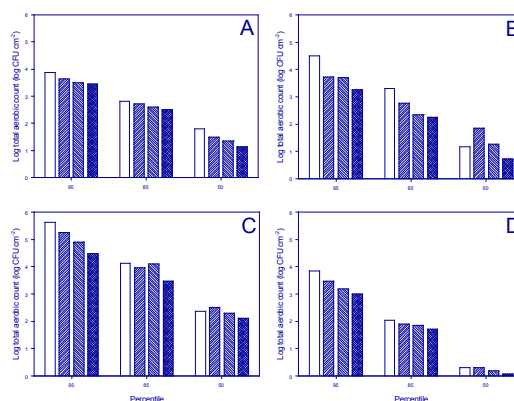


Figure 1: Percentile summaries of total aerobes on cattle (A), sheep (B), pig (C) carcasses and environmental surfaces (D) in UK slaughterhouses. Data were sorted into 12 month groups before performing calculations. Groups commenced on June 2002 (□), June 2003 (▨), June 2004 (▩) and June 2005 (■).

Discussion points:

- Statistical analyses of the log bacterial numbers in the datasets used to generate Figure 1 showed that measured bacterial numbers recovered from cattle, sheep and pig carcasses in UK plants have decreased significantly (t Test; $P < 0.05$) between June 2002-May 2003 and June 2005-May 2006.
- The observed reductions in numbers of total aerobes on environmental surfaces were also significant.
- The relationship between the month of sampling and bacterial numbers was investigated. Numbers of total aerobes on cattle carcasses were significantly elevated during the months of August, September and November (ANOVA, $P < 0.002$).

Conclusion:

It has been reported previously that microbiological testing for process control purposes in red meat plants is of questionable value because of the high degree of variation in the test results.

In the present study we used large numbers of samples from over 94 plants to try and overcome such variation in test results. We observed that total bacterial numbers on carcasses are seasonally elevated. Although any reasons for this are currently speculative, the month of sample collection is a factor external to the process; and so, the presence of such relationships may provide further evidence that microbiological testing for process monitoring purposes is of limited value for red meat processors.

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