REGULATORY HACCP – CARCASS AND ENVIRONMENTAL SURFACE BACTERIAL INDICATOR NUMBERS IN UK RED MEAT SLAUGHTERHOUSES

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Introduction

In keeping with an international trend of using a system to control hazards for meat processing, EU Commission Decision 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 carcases. 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. Almost 4 years worth of standardised bacterial indicator test results have been collected directly from 89 UK slaughterhouses and this paper presents details of how numbers of these indicators have changed over that period.

Materials and Methods

Data collection and entry: A SQL server relational database was used to hold the microbiological test results that were collected. Laboratory test result certificates were collected from participating plants using a commercial courier. Data entry into the database was using a custom-coded data entry form constructed in Microsoft Access 2000 or an internet-based data entry system. These forms validated the results that were entered to ensure sensible entries were inputted (e.g. dates were verified to be in the correct format). Independent dual entry of randomly selected portions of the entered data was undertaken to help assure the quality of data entry.

Statistical analysis of test results: Subsets of data were imported directly into a statistical analyses program (StatsDirect, Cheshire, UK). For normally distributed data, t-tests, and ANOVA were used. A P value of <0.05 was used for significance.

Results and Discussion

Summary overviews of the collected data are shown in Table 1. To date, 46,852 carcass test results have been collected from 89 uniquely-licensed plants along with 86,692 environmental and food contact surface test results. Collectively these plants represent over 77% of the total national slaughtering capacity for the UK. Collections for study year 3 and 4 datasets (June 2004 to May 2006) are ongoing and thus comments on these data relate to our preliminary analyses only.

Table 1: The number of commercial slaughterhouse test results collected each year. The numbers of plants that supplied these results each year or part of the year are shown in parenthesis.

	Number test results collected (number of plants[a])			
Year	Cattle	Sheep	Pig	Surfaces
June 2002 to May 2003	6590 (42)	4597 (41)	5190 (35)	28995 (65)
June 2003 to May 2004	5714 (41)	4174 (43)	3908 (34)	30938 (56)
June 2004 to May 2005	4050 (36)	2906 (34)	3307 (23)	15468 (47)
June 2005 to April 2006	2313 (24)	1695 (21)	2408 (20)	11291 (35)
Total	18,667	13,372	14,813	86,692

[a]Multi-species plants have been counted once for each species that they process.

Percentile summaries of the test results were prepared for each year. The results are shown as Figure 1. Statistical analyses of the datasets used to generate Figure 1 showed that measured bacterial numbers recovered from cattle, sheep and pig carcasses and slaughterhouse environmental surfaces in UK plants have decreased significantly ($P<0.05$) over the last 4 years. In general, the largest observed decreases towards the higher end of the distribution of counts occurred in the first and the second years of the legislation being introduced. In the UK, many plants did not routinely test carcasses or surfaces prior to June 2002, and so initially, some staff may not have been adequately trained for the aseptic collection of samples. Consequently, it is possible that the initially-measured bacterial numbers were artificially-inflated by poor sampling technique. As staff improved their sampling technique, the microbiological counts fell to more accurately estimate the bacterial numbers on carcasses and surfaces.

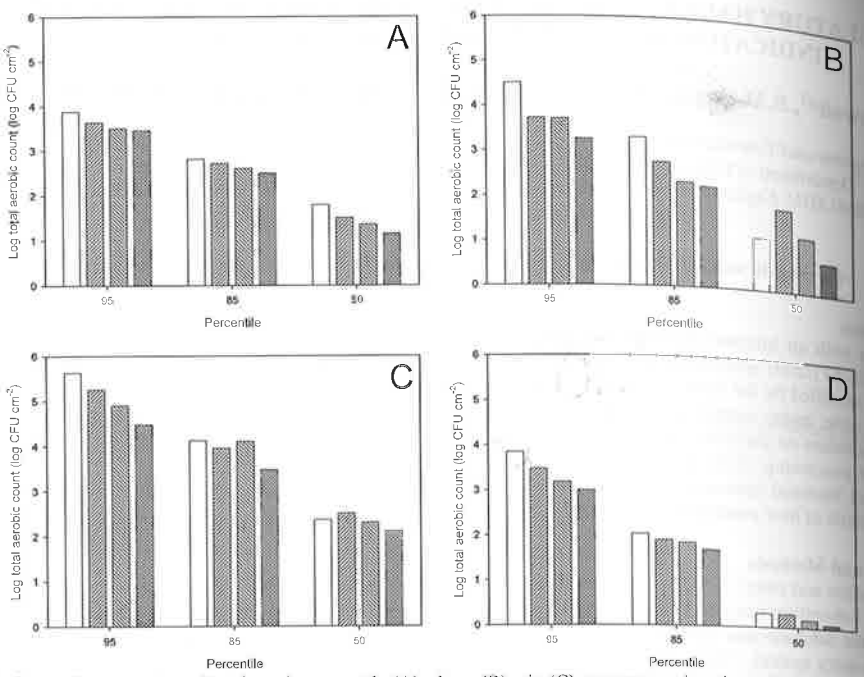

Figure 1: Percentile summaries of total aerobes on cattle (A), sheep (B), pig (C) carcasses and environmental surfaces (D) in U.K. slaughterhouses. Data were sorted into 12 month groups before performing calculations. Groups commenced on June 2002 (▨), June 2003 (▨), June 2004 (▨), June 2005 (▨).

Balanced against the initially-rapid decreases in bacterial numbers is the influence of reduced testing frequencies. After a period of satisfactory microbiological test results plants can switch to a reduced testing frequency. Although incomplete, increased numbers of plants changing to a reduced testing schedule is one of the reasons for the diminishing size of the data sets summarised in Table 1. Since the relative contribution to the total dataset of those plants with satisfactory results decreased over the four year period that the test results were collected it is a likely reason for the less-pronounced decreasing trends in bacterial numbers between 2004 and 2006.

Conclusion

Commission Decision EC/471/2001 was a forerunner for the revision of hygiene legislation in Regulation EC 852/2004, and microbiological criteria in Regulation EC 2073/2005 covering all food of animal and non-animal origin. The observation that bacterial numbers in slaughterhouses declined after implementation of the required HACCP based procedures partly justifies the creation of these new regulations. Any reduction in the bacterial numbers associated with food is a positive thing in terms of potential reductions to foodborne illness. However, any positive affect of reduced bacterial numbers on meat as a consequence of monitoring should not be confused with the appropriateness of microbiological testing for process control purposes in red meat plants. Our previous conclusion (Hutchison *et al.* 2005) that testing is of questionable value because of large variation in the test results remains unchanged.

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References

Anonymous. (1999) The evaluation of microbiological criteria for food products of an animal origin for human consumption. Opinion of the Scientific Committee on Veterinary Measures Relating to Public Health. Brussels: European Union.

Hutchison M. L., L. D. Walters, S. M. Avery, C. A. Reid, D. Wilson, M. Howell, A. M. Johnston and S. Buncic. (2005). A comparison of wet-dry swabbing and excision sampling methods for microbiological testing of bovine, porcine and ovine carcasses at red meat slaughterhouses. *Journal of Food Protection,* 68:2155-2162.