

**AN EVALUATION OF THE BUTCHERS' LICENSING
INITIATIVE IN ENGLAND**

FINAL REPORT

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List of Abbreviations / Glossary

ACC	Aerobic Colony Count – a measure of bacterial contamination.
ATP	Adenosine Triphosphate used as a marker of surface cleanliness.
Benchmark Clean Values	Levels of surface cleanliness obtained following implementation of good cleaning practices.
CCP	Critical Control Point – Any point or step at which control can be applied and a food safety hazard prevented, eliminated or reduced to an acceptable level.
cfu	Colony forming units, used to express numbers of bacteria growing during aerobic colony counts and thus can reflect surface microbial load.
Clean	Free from soil or food and / or chemicals and / or when the numbers and type of microorganisms (microbial load) is at an acceptable level for use.
Control Measure	Factors, actions or activities which can be used to prevent, eliminate or reduce to an acceptable level a food safety hazard.
Corrective Action	Action to be taken when the results of monitoring at the CCP indicate loss of control.
HACCP	Hazard Analysis Critical Control Point – An internationally recognised risk based approach to food safety management.
Hazard	A biological, chemical or physical property, or condition of, food with the potential to cause an adverse health effect.
Monitoring	The planned series of observations or measurements of a named parameter, at an identified critical control point. The values obtained should be recorded and compared to the target level and permitted critical limits. The results of monitoring ideally should be obtained rapidly and in time to allow remedial or corrective action to be taken, if the values are outside the critical limits.
PRPs	Pre-requisite Programmes – Those basic environmental and operating conditions necessary for the production of safe food. These underpin and support a HACCP plan.
RTE	Ready to Eat – Food that can be eaten immediately without any further processing, cooking or other control measure being used.

Executive Summary

A study was undertaken to evaluate the butchers' licensing initiative in England. The study consisted of three component parts:

1. Distribution of 2 questionnaires to determine butchers' knowledge, understanding and attitudes to HACCP and the licensing initiative.
2. A self audit to assess the butchers' perceptions and self reported practices relating to their own HACCP plans.
3. An audit of butchers' premises and HACCP plans to assess the quality, implementation and level of compliance with those plans. In premises agreeing to participate, a further assessment was made, using ATP bioluminescence and microbiology, of surface contamination and cleanliness.

Survey of Butchers' Knowledge, Attitudes and Understanding

Two thousand butchers were sent one of two different questionnaires. Useable results from 329 butchers were received, giving an overall response rate of 16%, which is typical for this type of survey. This part of the evaluation therefore, represents nearly 5% of English butchers.

The two types of questionnaires were sent to different sample populations throughout England with individual response rates of 15% and 18%. Answers to a small number of very similar questions common to the two questionnaires yielded responses typically within 10% of each other. This suggests the answers overall are representative of butchers.

- ◆ Butchers perceived their knowledge of food safety and their ability to undertake and implement HACCP had improved considerably (statistically significant) as a result of the HACCP training they had received. They also felt their knowledge and ability had further, marginally improved since their training
- ◆ Questions testing knowledge of aspects of HACCP and food safety were answered correctly on 70% of occasions. The correct response to individual questions ranged from 96% to as low as 7% indicating knowledge gaps / misunderstanding in some areas.

- ◆ In general, respondents did not believe butchers' shops presented a high risk to food safety and self reported they implemented high levels of food safety practices, although this may be over optimistic.
- ◆ Over 70% felt their food safety control had improved and staff were more hygienically aware as a result of the initiative. Only a minority (23%) believed it would help them attract businesses.
- ◆ Fifty four percent of respondents felt introducing HACCP had made little change to their working practices with only 11% believing it had been difficult to apply in butchers' shops.
- ◆ Forty three percent felt cross contamination was not possible in their premises, while 82% believed it was easy to prevent.
- ◆ A slight majority of respondents (53%) believed they could find time for monitoring HACCP and as part of licensing 59% believed it helped them to run their business more efficiently.
- ◆ The majority of respondents (63%) felt implementing HACCP would not have been possible without the MLC initiative with the training, training materials and consultants well received and regarded.
- ◆ Forty three percent believed they would require further help to maintain and update their HACCP.
- ◆ Butchers believed (84%) that EHOs were positive about their plans and that they worked well (88%).
- ◆ Ninety three percent claimed their HACCP plan had been checked by their EHO prior to re-licensing.
- ◆ There was a general uncertainty about whether the benefits of HACCP outweighed the costs. However, only 32% felt HACCP was an expensive system to introduce and only 26% that it had proved more expensive to maintain than they originally thought.
- ◆ Although a substantial minority (21%) were undecided, of those who expressed an opinion, nearly 58% believed that HACCP and licensing had not been a waste of time and effort with 41% agreeing it had been worthwhile.
- ◆ Increased time (hence costs) associated with implementing HACCP were less than previously estimated.
- ◆ A small minority of butchers (5%) had been refused a licence at some stage.

Self Audit

- ◆ Although cross contamination was claimed to be considered in the design of HACCP plans used for licensing, many responses indicated substantial remaining potential for it to occur.
- ◆ Claimed self reported responses to temperature monitoring indicated a high level of compliance, although the accuracy of the equipment was not always known.
- ◆ Some elements of cleaning were claimed to be well implemented with other key elements of good cleaning practice not well implemented.
- ◆ Although different sample populations were used, when compared to external audit the self audit indicated greater implementation of food safety practices.

Audit

- ◆ No premises audited was considered to pose an imminent risk to food safety.
- ◆ All shops had a licence although there was some variation in how local authorities undertook their work, particularly re-licensing.
- ◆ There was considerable variation in the standard of food hygiene management, including HACCP plans, used within the shops audited and many shops displayed elements of good practice.
- ◆ HACCP plans had not been reviewed by the proprietor in many shops (34%) and often did not include a process step diagram (23%). Ninety eight percent of plans were generic.
- ◆ Checks at time of receipt of raw materials were often poor, e.g. no check on delivery vehicle hygiene in approximately 75% of cases.
- ◆ Temperature monitoring procedures (e.g. goods on display) were sometimes inadequate and the accuracy of temperature monitoring equipment was unknown in a significant number of shops (39%).
- ◆ Considerable potential for cross contamination existed in many shops and standards of hand hygiene could be improved, e.g. 78% of staff may handle raw and cooked foods, audit observation saw 20% of staff moving between high and low risk areas who did not wash their hands.
- ◆ Facilities for hand hygiene, e.g. non hand contact taps, could be considerably improved, especially given the number of staff who served both raw and cooked products or shared facilities.

Surface Cleanliness

- ◆ Visual assessment indicated 24% of “in-use” surfaces were moist, especially hand contact surfaces and this can facilitate transfer and spread of bacteria.
- ◆ Compared to more scientific methods visual assessment of cleanliness was an unreliable indicator yet was the method most likely to be used.
- ◆ ATP levels (adenosine triphosphate – a measure of organic soil) on surfaces were variable but overall too high, especially on hand contact surfaces. There may be some evidence to suggest these have decreased slightly subsequent to the licensing initiative.
- ◆ Microbiological testing also indicated variability but overall many counts were too high, especially enterobacterial counts. Many counts were well in excess of “clean” benchmark values. Fewer hand contact surfaces were tested, of these, tap handles, chiller handles and till keys had high counts.

Nearly all English butchers now have documented HACCP plans and this has been achieved within a relatively short period of time. The butchers are the only small business segment of the food industry to have total documented systems.

Collectively the results indicate that butchers felt they had learnt a lot from the licensing initiative and it was possible to introduce HACCP into smaller businesses. However, they did not think that butchers’ shops presented a high risk and gaps in their knowledge of HACCP were identified. The MLC initiative was generally highly regarded and the costs of implementing HACCP required for the licensing were found to be manageable. In general, butchers felt that EHOs were positive about their plans but variation between local authorities was experienced.

Even though self audit probably provided an optimistic view of hygiene in butchers’ shops, data from this phase, from the questionnaires and probably more importantly from the external audits, indicated there was still considerable opportunity for cross contamination to occur.

1.0 Introduction

1.1 Background to the Project

HACCP principles, to a greater or lesser extent, have been or are currently being incorporated into the food safety legislation of many countries. The EU Hygiene Directive of 1993 (93/43/EEC) and the Food Safety (General Food Hygiene) Regulations (1995) (effectively incorporated a requirement for 5 principles of HACCP into food legislation). Future legislation is expected to require the operation of procedures based on all HACCP principles as defined by Codex (draft EU Regulations 2002 (0178/COD)) by all food business except primary producers. Within the spectrum of food businesses, butchers' shops that sell both unwrapped raw meat and ready to eat foods are a special case. The Pennington Report (1) , subsequent to the highly publicised E.coli O157 outbreak in Scotland, advocated licensing for butchers' shops pending the introduction of HACCP. This recommendation was implemented in England by the Food Safety (General Food Hygiene) (Butchers' Shops) Amendment Regulations 2000. This required all relevant butchers to be licensed by November 1st 2000 and the licence to be renewed annually. The purpose of this licensing was to introduce tighter controls on hygiene standards in butchers shops which sold both unwrapped raw meat and ready to eat foods. In order to obtain a licence or be re-licensed local authorities had to be satisfied each outlet met existing food hygiene legislation requirements, operated documented HACCP food safety management controls and had enhanced staff hygiene training requirements (2).

Legislation incorporating a licensing requirement might be perceived as a "stick" approach, i.e. forcing people to adopt HACCP and in most cases, where this has been introduced, it has often been followed by a considerable lag compliance period, the length of which is likely to vary between different sectors of the food industry and different businesses. There is evidence that larger producers have less difficulty in adopting and implementing HACCP than smaller ones. However, it can be introduced successfully and in a shorter time with sufficient support ("carrot" approach), even in small businesses at a manageable cost (3).

Incorporation of a HACCP requirement into legislation does not mean that food businesses will overnight possess and adhere to well constructed HACCP plans. Many barriers can prevent this, for example lack of knowledge and lack of training support can be major hurdles in developing as well as developed countries (4, 5). Additionally possession of a HACCP plan will not in itself ensure food safety. The production of safe food is more likely if a properly designed HACCP system is appropriately implemented with the necessary pre-requisite programmes.

In an attempt to minimise any lag time for compliance and to ensure relevant English butchers' shops were prepared for licensing, support was offered via the Meat and Livestock Commission (MLC) in the form of an accelerated HACCP initiative. The scheme provided / offered free information, training and consultancy. Individual butchers were encouraged to attend training sessions to obtain information on HACCP and how it could be implemented. Additionally, each butcher was allocated a consultant, who visited them in their shop, to provide further advice. When the consultant was confident that the plans were appropriate the business was "signed off" and the relevant local authority notified. Support to meet the licensing requirement , in other UK regions, did not involve the MLC and was implemented differently. Due to the scale and size of the project, different trainers and consultants were used. However, the MLC implemented steps to standardise the approach in order to minimise variation. Furthermore, with re-licensing, variation in interpretation between different local authorities could occur.

Although some attempts have been made to evaluate aspects of HACCP implementation and licensing (6, 7, 8, 9, 10, 11), the present project is the first to comprehensively assess this in England.

1.2 Aims and Objectives

The overall aim was to evaluate the effect of the Butchers' Licensing Initiative in England.

The more specific objectives were to:

- ◆ Determine butchers' knowledge and understanding of HACCP and food safety.
- ◆ Evaluate butchers' attitudes towards food safety, HACCP and the licensing initiative.
- ◆ Analyse problems / barriers encountered in maintaining HACCP plans.
- ◆ Evaluate the HACCP plans and documentation in use by means of self assessment.
- ◆ Audit 120 butchers' shops to examine documentation and compliance with the plans.
- ◆ Determine the effectiveness of cleaning within butchers' shops using microbiological and rapid techniques.

2.0 Knowledge and Attitudes to Food Safety, HACCP Implementation and Licensing

2.1 Introduction and Methods

2.1.1 Introduction

Traditional food safety strategies are based upon training in hygiene practices and a general risk management approach. Current legislation requires that food handlers are trained in hygiene to a level commensurate with their work activities.

Traditionally this training has been based upon the Knowledge, Attitude, Practices model (KAP) which assumes if people are trained, they will learn and then implement the knowledge acquired (12). Before people can implement good practice they must acquire the knowledge but this does not automatically mean it will be implemented. If a person has knowledge and a positive or supportive attitude they are more likely to implement or practice that knowledge. Therefore a food handlers' attitudes to what they have learnt and how it has been communicated are important. Even with a positive attitude there may be other barriers, e.g. lack of time, which prevents food handlers from being hygienic (12).

Traditional food hygiene courses are relatively well established. Courses on HACCP – a specific risk management approach - are a more recent development and not so widely available. There are also concerns that HACCP, originally developed for large scale food manufacturers, may be difficult to implement in small businesses.

The aim of this section of the evaluation was to:

Assess butchers' knowledge and understanding of HACCP as well as their attitudes to HACCP and the initiative.

The more specific objectives were to:

- ◆ Determine butchers' knowledge / understanding of HACCP.
- ◆ Analyse the perceived change in knowledge since the initiative.
- ◆ Evaluate butchers' attitudes towards food safety and HACCP.
- ◆ Evaluate butchers' attitudes towards the licensing initiative and its implementation.
- ◆ Analyse attitudes towards ongoing HACCP implementation.
- ◆ Determine butchers' perceived costs and benefits of having a HACCP plan.
- ◆ Determine butchers' self reported hygiene practices.

2.1.2 Method

Sampling

A database / directory of environmental health departments (April 2002) was obtained via the FSA. Environmental health departments listed with an email address were contacted with a letter of introduction from the FSA requesting names and addresses of licensed butchers. The responses were used as the sampling base for the project. All butchers (2700) on the lists provided were contacted.

Questionnaire Design

Two questionnaires were designed to meet the objectives (Appendix 1 and 2). These were based upon questionnaires used in a previous evaluation of the MLC initiative in England. Common questions could allow comparison with the previous study and were combined with new questions specific to this project. These were piloted on Welsh butchers (not part of the project) and were modified in the light of both the results / experience of the pilot exercise

and comments from the FSA. The questions were split over 2 questionnaires with the hope of achieving a higher response rate. For the purpose of the report responses and data on common issues from the 2 questionnaires have been combined and summarised. Questionnaires were distributed with a stamped addressed envelope. Approximately two weeks after the initial distribution a reminder was sent to non respondents. Non response bias was monitored through a small scale telephone poll. No significant differences ($p > 0.05$) existed between this group and survey respondents on variables of size, status or use of HACCP. Additionally, towards the end of the project, approximately 100 questionnaires were sent to targeted environmental health departments with a high ethnic population with the intention of increasing the number of responses from halal butchers.

Data from the questionnaires were analysed with SPSS using Chi Square, Mann Whitney and Wilcoxon statistical tests as appropriate. During discussion, where difference in responses between groups are described as significant, this implies at least 95% confidence ($p < 0.05$) that the differences are real. Percentages expressed in the tables have been individually rounded to the nearest whole number. Totals may therefore be either slightly above or below 100%.

2.2 Results

2.2.1 General Results and Responses

Table 2.1 indicates the number of questionnaires distributed and the response rates. The overall response rate was 16% although subsequently an additional 8 questionnaires have been returned but are not included within this report.

Table 2.2 indicates the responses by location, number of food handlers and ethnic type. Although minor variations existed in the type of respondents returning the two questionnaires, most noticeably inner city or suburban, overall the differences were not statistically significant. The two questionnaires were seen as complementary in that whilst each contained questions specific to that questionnaire, they also both carried questions that

addressed common themes. For optimum presentation, the responses to the questionnaires have been grouped and discussed by theme, e.g. attitudes to HACCP, rather than by individual questionnaire. Insufficient responses were received from ethnic butchers, to permit statistical evaluation.

Tables 2.3 and 2.4 provide a breakdown of the respondents (%) by type of business and by food safety practices claimed to be used prior to the initiative. The data in column marked “previous” are comparison data from an earlier MLC study (7). The “demographics” of the respondents are very similar, although figures for the present study add up to more than 100% due to multiple responses.

Table 2.1 The number of questionnaires distributed and response rates.

	Number	Initial : Reminder
Distributed questionnaires (equal A and B)	3000	2000 : 1000
Total number of responses	362	
Number of usable responses	329	
	Number	% Response Rate
Usable responses to questionnaire A	148	15%
Usable responses to questionnaire B	181	18%

Table 2.2 The response rates for each questionnaire in relation to size, geographical location and ethnic type.

Responses By:	Overall	QA	QB
<u>Size</u>			
<10 Food handlers	89%	91%	88%
10 or >10 Food handlers	11%	9%	12%
<u>Geographical Location</u>			
Inner City Urban	16%	10%	21%
Suburban	45%	51%	30%
Rural	39%	39%	39%
<u>Ethnic / Other Type</u>			
Traditional	97%	99%	95%
Kosher	1%	0	2%
Halal	2%	1%	3%

Table 2.3 Respondents (%) by business type and self reported retail practices

Business Type	Current	Previous*
Manufacturing and wholesale cooked meat and products	10	9
Manufacturing <u>wide</u> range cooked meat premises only	19	17
Manufacturing <u>limited</u> range of products premises only	37	41
Buying in extensive cooked meat products	12	5
Buying in limited range of cooked meat products	33	18
Canned meats / products only	3	N/A
Not selling ready to eat products	5	10

* Comparison data, See Reference 7

Table 2.4 Breakdown of respondents (%) by self reported practices “in use” prior to the initiative

	Current	Previous
<u>General Hygiene</u>		
Cleaning Schedules	73	65
Pest Control	74	61
Microbiological Testing	10	6
Temperature Monitoring	80	81
Delivery Inspection	86	62
Hygiene Training	78	87
Stock Rotation	96	84
Separation of Raw and Cooked	93	95
<u>HACCP Based</u>		
Identification of Hazards	67	70
Determination of CCPs	62	44
Specification of Target Levels	52	40
Monitoring of CCPs	53	47
Specified Corrective Actions	65	55
Verification of Systems	41	25
Documentation	43	40

2.2.2 Actual Knowledge of Food Safety and HACCP

Across the two questionnaires, the butchers were asked a total of 13 food safety / HACCP based knowledge questions. The results are presented in Table 2.5. The questions ranged from knowledge of food safety hazards, and thus hazard identification, to step (flow) diagrams, control measures and monitoring. Allowing for the format of the questions (+ve or -ve direction), and don't knows, the overall mean correct response was provided on 70% of occasions. The correct response rate did however vary from 96% to as low as 7% depending upon the question. Insufficient responses from ethnic butchers

were received to make any statistical assessment possible. There was no significant difference by number of food handlers in response to the two questions dealing with hazard identification. Businesses with <10 food handlers were more likely to score incorrectly on the questions relating to the meaning of a corrective action. There were no significant differences in response, by size, to the other questions. There were no significant differences in responses by business type of operation (i.e. manufacturing wholesaling/retailing see Table 2.3)

Table 2.5 Butchers' responses to knowledge based questions

	Agree	Disagree	Don't Know
Campylobacter bacteria are often associated with poultry	47	30	23
E. coli O157:H7 can be a problem associated with raw meat	82	15	3
Storing cooked food in a refrigerator is an example of a corrective action	72	26	2
Control measures eliminate or reduce food safety hazards	93	7	0
Handling cooked meat with clean tongs is a control measure	92	8	1
Cooking meat to a centre temperature of 70°C for 2 minutes is an example of a critical limit	81	14	5
Cooking meat to a centre temperature of 70°C for 2 minutes can control all hazards associated with cooked meats	22	73	4
Hands are the greatest risk for cross contamination	78	22	0
Step (flow) diagrams are an essential part of a HACCP plan	66	22	12
Identifying hazards associated with meats is helpful but not a legal requirement	35	63	2
A hazard can be defined as anything in food with the potential to cause harm	96	4	0
Monitoring procedures are a set of pre-determined values for control measures at a CCP	90	7	3
One benefit of establishing a HACCP system is that it can be possible evidence for a due diligence defence.	96	3	1

2.2.3 Knowledge Perceptions and Changes Over Time

The changes in butchers' perceived knowledge of HACCP and food safety before the initiative, immediately after the initiative, and now, are presented in Table 2.6. Twenty-one questions were asked ranging from their perceived knowledge of personal hygiene requirements for food handlers to their understanding and ability to operate a HACCP plan, thus these questions reflect the butchers' perceived benefit from attending the training. Responses were coded using a 5 point Likert scale where 1 indicated little knowledge /

ability and 5 complete knowledge / ability. One hundred percent of respondents felt that their knowledge had improved subsequent to the training with a mean score before training of 3.10 increasing to 4.37 immediately after training. One hundred percent of respondents also felt that since the training their knowledge / ability had further slightly increased to a present day mean score of 4.49. Perhaps of particular note were responses to questions dealing with the day to day management of a HACCP system, increasing from 2.45 prior to training to 4.56 present day. Similarly, scores to responses for questions dealing with verifying and modifying the HACCP plan increased from 2.48 and 2.47 to 4.43 and 4.46 respectively.

Table 2.6 Perceived changes in knowledge and attitudes over time

	Mean rating before training	Mean rating immediately after training	Mean rating now
Personal hygiene requirements for food handlers	3.96	4.55	4.60
What high risk foods are	4.00	4.55	4.63
Potential food hazards and their severity within your business	3.68	4.42	4.52
Environmental conditions that encourage bacterial growth	3.56	4.45	4.48
Bacteria that can cause foodborne illness*	3.30	4.26	4.32
The Hazard Analysis Critical Control Point (HACCP) system*	2.47	4.27	4.35
Requirements that must be met at each Critical Control Point to ensure the safety of food	2.73	4.32	4.41
Procedures for monitoring at Critical Control Points*	2.57	4.23	4.34
How to implement corrective actions in HACCP*	2.63	4.23	4.40
HACCP record keeping / documentation system	2.31	4.40	4.54
Safe cooking temperatures for meat products	3.54	4.49	4.58
The legal requirements for food safety in butchers premises	3.26	4.33	4.43
Recognise potential food hazards and assess their severity within your food business	3.50	4.39	4.52
Identify Critical Control Points	3.04	4.33	4.50
Take corrective action when something is wrong	3.72	4.56	4.66
Identify if control measures have not been implemented properly	3.24	4.42	4.55
Minimise the risk of producing unsafe food	3.81	4.53	4.65
Manage a HACCP system yourself from day to day	2.45	4.36	4.56
Check / verify that the HACCP system is working	2.48	4.30	4.43
Modify the HACCP plan to incorporate changes in working practices / shop layouts / product ranges	2.47	4.29	4.46
Ability to train other employees to work within HACCP	2.41	4.19	4.33

Businesses with <10 food handlers were significantly more likely to perceive their knowledge to four of the questions (marked with an asterisk in Table 2.6)

to be poor BEFORE training. There were no statistically significant differences, in responses by number of food handlers, to any of the questions AFTER training. The improvement in perceived knowledge and ability after the training was statistically significant for all respondents.

Businesses classified as wholesaling or manufacturing a wide range of cooked meat products (see Table 2.3) were significantly more likely to believe they had a better knowledge of cooking temperatures than other types of business.

2.2.4 Discussion

The response rate (16 % overall), whilst disappointing is typical for this type of study (13, 14, 15). It had been hoped for a response rate approaching 30%, which, although higher than normal for this type of study, was obtained in an earlier evaluation of the MLC initiative (7). However, this had been at the start of the MLC initiative when butchers may have been more enthusiastic or motivated to respond. In all 2000 different butchers were approached (for this part of the study) representing somewhere in the order of 29% of all English licensed butchers. The response rate was very low for halal butchers (2%) in spite of a specific targeted effort via selected EHOs to encourage them to complete the questionnaires. The low response could have been due to language or cultural difficulties but could also reflect their perceived lack of interest and need for licensing in relation to their business (see section 4). Responses were primarily (89%) from smaller businesses and of suburban origin. The respondents were dominated by butchers who either manufactured or bought a limited range of products (see Table 2.3) who, in theory, should be of lower risk. However, 10% of respondents did claim to produce some cooked meat products on the premises. The balance of respondents was similar to the previous MLC study (7), although greater numbers are now more likely to “buy-in” cooked meats for resale, rather than manufacturing their own. The number of respondents claiming to operate particular hygiene and / or HACCP practices prior to the initiative although slightly higher, was not statistically significant from a previous study (see Table 2.4 and Reference 7). This slight difference may be due to a rose tinted view of the past after several years of working with licensing.

Training in HACCP, as provided by the MLC, has been considered equivalent to the RIPH certificate in HACCP Principles (a level 2 qualification). The questions used to test the butchers' knowledge were equivalent to the questions used in assessing this course, or of the type used to assess a basic hygiene course. Fifty three percent of respondents did not know that *Campylobacter* was often associated with poultry and 18% did not know that *E.coli* O157 could be a problem associated with raw meat. The latter is perhaps particularly surprising given the Lanarkshire outbreak and the original stimulus for licensing. Both these questions test aspects of hazard identification which is the starting point for hazard analysis. In general, responses to questions requiring a simple agreement were answered better than where the butcher had to disagree with the statement. Normally in this type of study statements requiring "agreement" would be counterbalanced in equal numbers by those requiring disagreement. Two of these questions in particular – regarding the meaning of a critical limit, and monitoring procedures, were particularly poorly answered. This does raise questions about the respondents' understanding of HACCP terminology. This is supported by the response to other questions, e.g. the need for a step (process) flow diagram which is an important part of the Codex Logic Sequence (Number 5) and was taught as part of the MLC initiative.

The respondents felt that the initiative had considerably helped them to improve their knowledge of food safety and HACCP and this was statistically significant for all respondents. Although lower than the perceived increases due to training, respondents also felt that having implemented the system their abilities had continued to improve. On the 5 point scale, the lowest perceived response "now" was 4.32 indicating they felt confident in their current abilities. Some of the positive responses in this section, e.g. relating to knowledge of legal requirements, or knowledge of recognising bacteria capable of causing food borne illness, were in contrast to the incorrect answers given in 2.2.2 . This might suggest some butchers had misplaced confidence in their abilities.

2.3 Attitudes Towards Food Safety, HACCP and Implementation of the Initiative.

2.3.1 Attitudes to Food Safety (General)

Table 2.7 contains responses to 12 questions concerning different aspects of food safety / hygiene including aspects of cleaning. High numbers of respondents (over 90%) claimed that hand contact surfaces were included in their cleaning programme, surfaces were checked visually after cleaning, clean as you go was not too expensive, and raw food packaging was disposed of immediately. However, 11% felt handwashing on all recommended occasions took up too much time, 18% that staff did not need to receive training in cleaning, 18% that cleaning equipment is still wet when stored, 20% that it is difficult to get staff to change their practices and 51% that butchers' shops do not present a high risk.

Table 2.8 contains responses to 7 specific questions on cross contamination. Over 99% claimed their HACCP plan separated equipment for raw and cooked areas and 97% that having separate areas for raw and cooked food was essential.

Table 2.7 Butchers' responses to questions on food safety and cleanliness

	(% cases)		
	Agree	Disagree	Don't Know
Handwashing on all recommended occasions would take up too much time	11	88	1
Visual checking of surfaces after cleaning is part of the cleaning routine	97	3	1
Clean as you go is too expensive to implement	7	93	0
My staff should receive training in cleaning	80	18	1
Using paper towels for cleaning is too costly	22	72	6
We use disposable paper towels for cleaning	62	38	0
Disposable cloths can be re-used	4	96	1
My cleaning equipment is still wet when stored after use	18	80	1
Raw food packaging is disposed of immediately	96	4	0
Hand contact surfaces are included in my cleaning schedule	97	2	1
It is difficult to get staff to change their food hygiene practices	20	62	19
Butchers shops present a high risk to food safety	36	51	13

Table 2.8 Butchers' responses to questions on cross contamination

	(% cases)		
	Agree	Disagree	Don't Know
Cross contamination is not possible in my shop or premises	43	52	5
Cross contamination is easy to prevent	82	16	1
Having separate areas for raw and cooked foods is essential	97	2	1
Having separate equipment for raw and cooked foods is part of my HACCP plan	99	0	1
It is difficult to keep separate equipment for high risk areas	7	92	1
It is difficult to stop staff moving between high and low risk areas	45	53	2
It is undesirable to sell raw and unpackaged cooked food from behind the same shop counter	51	35	15

2.3.2 Attitudes Towards HACCP and the Implementation of the Initiative

Table 2.9 contains responses to 31 questions examining the butchers' attitudes towards HACCP and licensing. These were originally scored on a 5 point scale, where 1 indicated complete agreement and 5 complete disagreement. For ease of presentation (within Table 2.9) these have been conflated to 3 points with the mean quoted, based on the original 5 point score. The mean rating across all questions was 3.38 although responses to individual questions varied considerably. Butchers who wholesaled or manufactured a wide range of meat products (see categories Table 2.3) were significantly more likely to have encountered problems with implementing HACCP (responses to 7 questions) compared to those who mainly bought in.

Respondents (54%) felt that HACCP meant little change to their working practices and only 11% felt the system was difficult to apply to butchers. Additionally 89% believed it could be used in other food businesses. Overall slightly more respondents believed that licensing had been worthwhile than were against it (41% compared to 37%) although 22% were unsure. Fifty nine percent believed the monitoring they were doing for licensing helped them run their business efficiently. Whilst 71% believed it gave them greater confidence in food safety, and improved staff hygiene awareness (78%), they did not believe (only 23%) this would enable them to win more business, although it might ease consumer concerns (52%). Respondents felt that EHOs

had checked their HACCP plans prior to re-licensing (93%), were positive about them (84%) and that the EHOs thought the plans were working well (88%). Seventeen percent thought their plans had **not** been checked prior to re-licensing. Butchers who manufactured a wide range of meat items were significantly more likely to report their plan had been rechecked prior re-licensing.

Table 2.9 Responses to questions concerning butchers' attitudes to HACCP and licensing

			(% cases)		
	Mean	SD	Agree	Disagree	Don't Know
Introducing HACCP meant little change to my working practices			54	45	1
Maintaining the HACCP plan has required no changes since its introduction			38	62	1
The monitoring I do for licensing helps me to run my business efficiently	2.53	1.14	59	22	20
HACCP requires minimal documentation	3.52	1.16	26	57	17
HACCP will enable the business to win more customers	3.35	1.08	23	45	32
HACCP has had little impact on the daily running of the business	3.36	1.11	27	53	20
The HACCP system could be used in any type of food business	1.82	0.72	89	3	9
It is difficult to keep up with the documentation required by HACCP	3.04	1.05	33	43	24
The business will not need anymore help in the future to maintain and update the HACCP system	3.51	1.00	43	28	30
Having a HACCP system gives me greater confidence in my management of food safety	2.72	1.32	71	19	10
It is difficult to apply HACCP to butchers shops	3.61	0.84	11	69	20
HACCP systems increase staff awareness of food hygiene issues	2.22	0.96	78	13	9
Nationally publicised food safety scares have increased my awareness of the need for systems like HACCP	2.42	1.02	69	19	12
HACCP will help ease customer concerns about food safety	2.73	1.08	52	26	22
Food hygiene is under greater control since implementing HACCP	2.20	1.11	73	18	10
The system of internal auditing recommended in the MLC pack is very useful	2.51	0.90	57	11	33
My experience of working and monitoring my HACCP plan has been easy	2.70	0.96	53	24	22
My HACCP plan has not changed since it was agreed with the MLC consultant	2.78	1.04	55	35	10

I feel that food safety is much more under control now than before the initiative	2.61	1.15	61	24	15
Having a HACCP plan has helped my business	3.12	1.11	34	39	27
My EHO is very positive about my HACCP plan	1.96	0.76	84	3	13
Licensing has been worthwhile	3.05	1.24	41	37	22
My EHO checked my HACCP plan thoroughly before re-licensing me	1.76	0.66	93	3	4
My HACCP plan was not checked before I was re-licensed	4.04	1.00	17	85	3
I have difficulties in training new staff in my HACCP work practices	3.68	0.83	10	65	25
My current HACCP plan is simpler than the one approved by the consultant	3.12	0.91	24	34	42
My EHO thinks my HACCP plan works well	1.94	0.54	88	0	12
I have been able to find the time required for monitoring HACCP	2.79	1.03	53	26	22
I still use the forms provided in the training pack	2.50	1.11	66	26	8
Form filling has not proved a barrier to monitoring HACCP	2.62	1.04	58	22	20
I check my HACCP using internal auditing	2.31	0.77	70	9	21

Eleven questions related to the butchers' experiences since formulating the original HACCP plans. Thirty five to sixty percent (2 questions) believed their plan had changed since its introduction with 24% believing it was now simpler. Forty three percent believed they would have a future need for additional help in the future to maintain and update the plan.

Thirty three percent believed it was difficult to keep up with documentation with 53% believing they had found the time required for monitoring. Fifty eight percent believed form filling was not a barrier with 66% stating they still used the forms provided in the original training pack. Butchers manufacturing a wide range of cooked meat products were more likely to believe that recording and maintaining HACCP was difficult and that HACCP was **not** a cheap system to operate.

Fifty seven percent claimed to use the short internal audit process form developed by the MLC and that it was useful. Sixty five percent felt it was not difficult to train new staff in HACCP practices.

Table 2.10 contains responses to questions about the initiative's implementation and these were generally positive and consistent. Sixty three percent felt it would not have been possible to implement HACCP without the initiative, only 31% felt that information on HACCP was widely available. Sixty two percent felt the initiative was well implemented with 68% thinking the training was good, 70% thinking the training material was good, and 72% thinking the consultant had helped.

Table 2.10 Butchers' responses to initiative implementation

			(% of cases)		
	Mean	SD	Agree	Disagree	Don't Know
It would not have been possible to implement HACCP without the help provided by MLC and their consultants	2.36	1.08	63	17	20
Information on HACCP was widely available before getting involved with the MLC initiative	3.16	0.97	31	42	28
On reflection I think the initiative was well implemented	2.52	0.96	62	16	23
On reflection I thought the consultant helped a lot	2.22	.087	72	9	20
On reflection I do not think the training I received was very good	3.66	0.86	10	68	22
I think the training material from the MLC was very good	2.29	0.88	70	10	20
HACCP would not have been implemented if the business had to pay for the training and advice provided by the MLC	3.10	1.05	31	38	31

2.3.3 Perceptions of Cost and Benefit

Table 2.11 summarises responses to perceived costs associated with HACCP. There was considerable uncertainty concerning whether the benefits of HACCP outweighed the costs and this is reflected across all the questions in Table 2.11, including a large number of 'Don't Knows'. However, overall only 22% felt that HACCP and the licensing initiative had been a waste of time and effort.

Table 2.11 Butchers' responses to questions concerning costs and benefits of HACCP

			(% of cases)		
	Mean	SD	Agree	Disagree	Don't Know
The benefits of implementing HACCP DO NOT outweigh the costs	2.83	1.00	39	27	35
HACCP is a cheap system to implement	2.77	1.00	48	25	27
HACCP is an expensive system to introduce	3.01	1.04	32	39	29
HACCP systems help stock control and reduce product loss	2.95	1.18	46	33	22
HACCP has proved more expensive to maintain than I originally thought	3.15	0.94	26	44	31
The HACCP and licensing initiatives have been a waste of time and effort	3.40	1.19	22	58	21
Increased costs have proved a barrier to monitoring in HACCP	3.31	0.87	14	46	40

Tables 2.12 and 2.13 contain detailed responses relating to increases or decreases in food hygiene cost implications since licensing. Respondents felt that working with HACCP (monitoring, recording, record keeping) had increased costs (77% and 74% respectively). Only 20% and 24% felt it had stayed the same. Forty eight percent felt they spent more time on checking products on delivery and storage (50% believed it had stayed the same). Thirty eight percent claimed to spend more time on cleaning with 47% thinking cleaning materials costs had increased (57% and 47% claimed it was level).

The mean value quoted per business for increased cleaning times was 5 hours / week with an increase of £17 / week. Increased time spent on record keeping for HACCP was 2.5hours / week with an additional 2.3 hours spent on checks and 3.4 hours / week on monitoring and recording HACCP data.

Table 2.12 Butchers' perceived changes in work practices since the initiative

			(% of cases)		
	Increase	Decrease	Level	Not Applicable	Mean* Change
Time spent, <i>per week</i> , on cleaning	37.6	0.0	57	5	2
Weekly cost of the cleaning materials	47.4	0.6	47	5	9
Time spent per week on monitoring and recording HACCP data, e.g. fridge temperatures, food temperatures, cooking times	77.2	0.7	20	3	3
Weekly time spent keeping HACCP records and updating the system	73.9	0.7	24	1	2
Weekly time spent checking food products upon delivery, storage and / or display.	48.3	0.0	50	2	2

* Statistics for all those respondents who indicated a direction of change or a level response

Table 2.13 Level of increases since initiative implementation

Statistics for those respondents who indicated an increase in time / cost			
	Mean	SD	Range
Time spent, <i>per week</i> , on cleaning	5.1	4.85	0.30 - 28.00
Weekly cost of the cleaning materials	17.9	38.70	0.00 - 03.00
Time spent per week on monitoring and recording HACCP data, e.g. fridge temperatures, food temperatures, cooking times	3.4	3.51	0.50 - 21.00
Weekly time spent keeping HACCP records and updating the system	2.5	1.80	0.50 - 10.00
Weekly time spent checking food products upon delivery, storage and / or display.	2.3	2.12	0.50 - 12.00

2.3.4 Discussion

The results presented in Table 2.7 provide an insight into how butchers feel about aspects of food safety, especially cross contamination, and represent the views of approximately 4.7% of English butchers. This is important given the potential for transfer of pathogens between raw and cooked foods. It has been suggested that up to 95% of food poisoning (in the UK) are sporadic cases with only 5% associated with general outbreaks. The location of sporadic cases is largely unknown, however for general outbreaks, butchers shops are not a frequently implicated location (16). For their inclusion within the evaluation, the respondents had to serve both unwrapped raw meat and ready to eat foods in butchers' shops, and the findings of the Pennington report, plus the severity of *E.coli* O157 food poisoning, it is perhaps surprising that only 51% felt butchers' shops present a high risk to food safety. This optimistic bias has been noted in the catering industry (12,17) and illustrates that food handlers tend to think food poisoning always happens in other people's businesses. This could indicate there may be complacency in the sector in relation to food safety risk.

With respect to background safety practices relating to cleaning and cross contamination, some of the responses indicated a strongly positive attitude, e.g. 97% claimed that hand contact surfaces were part of their cleaning schedules. This would be atypical of other sections of the food industry (See also Section 4) and supports previously reported and published concerns over self reporting of food safety behaviour (12). These and other responses, e.g. to

handwashing, cleaning equipment stored wet, etc. could represent an optimistic view of their own practices.

Table 2.8 contains the responses to questions concerning cross contamination. Results to these questions are somewhat contradictory and display attitudinal ambivalence, i.e. the respondents know the importance of cross contamination but feel that other more practical day to day aspects of running a business may be more important. For example, 99% stated that separate equipment for raw and cooked foods was part of their HACCP plan and it is likely this is prompted by the training received and the publicity associated with the initiative. However, only 53% agreed it could be prevented in their premises and 45% that it was difficult to stop staff moving between high and low risk areas. This type of response has been found in other studies.

The licensing requirement and the need to have HACCP plans was not initially greeted with great enthusiasm by the butchers, who felt their sector was being picked on. It is therefore not surprising that there was some negativity displayed in the attitudinal responses to HACCP.

Given their initial reservations on HACCP and licensing (7) the butchers' responses indicate that, to some extent, they have come to terms with the requirement. Although impacting on their work practices, more respondents, who expressed an opinion, felt it was worthwhile. This attitude can be seen in conjunction with the responses to 2.2 where butchers felt their knowledge had improved as a result of the initiative and was still improving. Several responses also indicated butchers now had greater confidence in their ability to manage food safety. Cumulatively, the butchers' opinions also indicated EHO approval for their activities. A small, but significant, minority (approximately 10%) claimed that there had been no re-inspection prior to re-licensing and this may be a reflection of different EHO practices around the UK. This practice was confirmed in a telephone conversation with one EHO. Butchers manufacturing a wider range of products were more likely to report being visited prior to re-licensing and it could be that EHOs were assessing the risk posed by individual butchers. Overall the butchers indicated they were coping

with the extra effort required to implement HACCP, something which is often cited as a problem for small businesses (4).

Concerning the implementation of the initiative, views were generally consistent across the different areas assessed with responses giving approval to the MLC initiative overall. The training, training materials and use of consultants were highly rated (62-70%) and this should be brought to the attention of the MLC.

Introducing HACCP is thought to bring an extra financial burden on small businesses (4). There were a high number of ‘Don’t Know’ responses in this section, compared to most other questions and generally similar numbers agreed and disagreed with the statements presented to them. This suggests butchers overall had no clear views with respect to the costs of introducing HACCP. However, overall 58% felt that the HACCP and licensing initiative had not been a waste of time and effort and 41% agreed it had been worthwhile. Whilst the areas of perceived increased cost from implementing HACCP were similar to previous findings, the magnitude of the perceived increases was lower than in a previous study (7). This suggests the cost of implementing revised food safety practices after the initiative was not as high as originally estimated (see Table 2.14). A number of other findings in the present evaluation, e.g. number of respondents believing more help would be needed, beliefs concerning benefits and costs, are in relatively close agreement with the earlier study of the MLC initiative (7).

Table 2.14 Comparison of perceived estimated time increases in food safety management now and at the time of the initiative implementation

Increases in time spent on:	Hours / Week	
	Now	Previous Study
Cleaning	5.1	18
Monitoring	3.4	5.4
Documentation	2.5	1.9

2.4 Key Findings and Implications

Findings	Implications
1. Butchers perceived their knowledge of food safety issues, and their ability to do HACCP, had initially improved considerably as a result of the original training and marginally since then	Indicates value / benefit of the original initiative
2. Some responses indicated gaps in knowledge and understanding of HACCP, e.g. hazard identification	Highlights areas for further attention by butchers and EHOs. Also suggests that some butchers may benefit from refresher training.
3. Some of the responses concerning self reported implementation of practices were high and possibly optimistic, the butchers' did not perceive their shops as high risk	Could result in overconfidence in abilities / systems Could indicate butchers know what to do but do not always implement what they know Greater, regular use of self-audit techniques may help to engender realism / objectivity
4. Over 70% felt their food hygiene was under greater control since implementing HACCP Staff (78%) were more aware of food hygiene issues. Only a minority (23%) believed it would help them attract businesses.	Suggests benefits from the initiative
5. 54% of respondents felt that introducing HACCP had meant little change to their working practices with only 11% believing it had been difficult to apply	It is possible to introduce HACCP into smaller businesses
6. 43% felt cross contamination was not possible in their premises, while 82% believed it was easy to prevent, although 45% agreed it was difficult to stop staff moving between high and low risk areas Nearly 100% believed separate areas and equipment were essential and part of their HACCP plan, yet only 51% believed it undesirable to sell raw and unpackaged cooked foods from behind the same counter	Coupled with the previous responses could suggest butchers do not really perceive RTE meats are associated with risk and/or cross contamination but are claiming to try to prevent it to meet legislative requirements.
7. The majority of respondents (53%) believed they could find time for monitoring HACCP and as part of licensing 59% believed it helped them run their business more efficiently	It is possible to introduce HACCP into small businesses
8. The majority of respondents (63%) felt implementing HACCP would not have been possible without MLC initiative	Indicates value / benefits of the original initiative
9. 43% felt they would require further help to maintain and update their HACCP plans.	Coupled with findings relating to gaps in knowledge / understanding there may be a need for additional training / updating / support . This could be centralised via the MLC or at a local level through EHO's and could require butchers to pay / contribute.
10. The initiative and its implementation were well received by respondent butchers with 62% believing it well implemented and approximately 70% liking the training and use of consultant	Indicates value / benefits of the original initiative

<p>11. Butchers believed their newly introduced food safety systems found approval with EHOs, gave them greater control of food safety and were, in general, manageable</p>	<p>It is possible to introduce HACCP into small businesses</p>
<p>12. Only 22% felt the initiative had been a waste of time and effort with 41% agreeing licensing was worthwhile. There was uncertainty about whether the benefits outweighed the costs</p>	
<p>13. Costs of running new HACCP plans could be lower than previously estimated</p>	<p>Implications for other small food businesses that it is possible to introduce HACCP without excessive financial burden</p>

3.0 Self Audit of Food Safety Practices and Management Systems

3.1 Introduction and Method

3.1.1 Introduction

Many food handlers underestimate the risk associated with their business and often express positive attitudes towards implementation of general aspects of food safety and more negative attitudes towards specific practices (17,22). There may also be a reluctance to accept other people's assessment of their food safety management practices, and self realisation can be of greater value (17,22). To achieve this, self assessment checklists have been found to be a useful diagnostic and educational tool (17,22). In order to gather data on butchers' perceptions of their HACCP plans, a self audit checklist was devised. At the same time butchers' opinions on the checklist were also collected.

3.1.2 Method

An audit self assessment checklist was devised, based upon the audit checklist described in Section 4. The audit checklist was shortened and simplified. Further changes were made based upon comments provided by the FSA and after piloting on a small sample of Welsh butchers. The final self audit checklist (Appendix 3) contained 102 questions separated into 3 sections which mirrored those in the checklist used by the external auditors.

Section 1 covered documentation and records and contained 45 questions, Section 2 related to observation and self reported practices / facilities (45 questions). The final section contained 12 general questions.

Additionally, a single A4 Evaluation sheet was distributed with the checklist and a stamped addressed envelope. The sampling and distribution protocols were the same as the knowledge and attitude questionnaires described in Section 2.1. The evaluation sheet required the respondents to indicate the

length of time taken to complete the self audit sections and answer 8 questions about the checklist.

Seven hundred self assessment checklists were distributed.

3.2 Results and Discussion

3.2.1 Results of Checklist Responses

Seventy four useable self assessments (representing an 11% response rate and the views of approximately 1% of licensed English butchers) were returned and the responses to individual questions are contained in Table 3.1.

All respondents currently had a licence, although 5% claimed to have been refused a licence at some stage. Ninety seven percent claimed to have a documented system, although it is a requirement of licensing. Ninety two percent felt their HACCP plan could be implemented even if a key member of staff was absent, although only 64% claimed to have a step (flow) diagram. Ninety three percent claimed to have considered cross contamination in the design of their HACCP plan. There were five questions relating to monitoring, with high percentages claiming this had a stated frequency (87%), procedure (92%) with staff being trained (79%). Additionally, 87% claimed to keep records of monitoring with 75% claiming they kept calibration records. However, 15% claimed that critical limits were regularly / frequently exceeded. There may however, have been some confusion and butchers may have thought that exceeding critical limits showed stricter control. If this is the case then there is an obvious lack of understanding of HACCP terminology. Ninety three percent had appropriate corrective actions stated with 90% believing that this allowed them to regain control of the product. Responses to questions concerning temperature monitoring were generally positive (92% food during storage and 84% cabinet air temperatures). Responses to questions on cleaning were more varied with 89% claiming cleaning schedules specified the use of biocides but only 40% claiming they specified a contact time or that biocides should be freshly prepared.

Responses to the observation section were also variable with 100% claiming monitoring was carried out as specified in the HACCP plan. Eighty eight percent claimed raw and cooked foods were unpacked separately with 94% claiming they were displayed separately. However, other aspects relating to cross contamination were less likely to be implemented or complied with, with 65% stating staff could handle raw and cooked food, 58% admitting common surfaces for raw and cooked foods, and only 36% who felt equipment and utensils for raw foods were completely separated from cooked foods. Eighty three percent claimed to have separate scales for raw and RTE foods with 70% claiming separate chillers.

Only a third claimed to have staff medical screening procedures in place, although 84% did keep a record of staff illnesses. Self reported responses concerning handwashing facilities indicated high compliance rates. One hundred percent claimed to supply soap, 88% disposable towels, 97% waterproof dressings, 100% suitable sinks and 96% reminder notices.

Ninety nine percent of respondents claimed they had been audited / inspected, however 47% had at some stage made changes to the HACCP plan. Eighty eight percent claimed the plan was reviewed annually although only 40% had undergone any refresher training.

Table 3.1 Summary of self audit questions

Question No:	Questions	Percentage			
		Yes	No	Don't Know	Not applicable
Documentation / Records					
1.1	Does your shop hold a current licence	100			
1.2	Have you ever had a licence refused	5	95		
1.3	Do you have a documented HACCP plan	97	3		
1.4	Are all products covered by the HACCP plan	95	3	1	1
1.5	Can your HACCP plan be implemented even if a key member of staff is away	92	1		7
1.6	Has your HACCP system been reviewed since signing off by the consultant	86	11		3
1.8	Have you made changes to the HACCP plan since initial formulation	69	28	1	1
1.9	Are there step (flow) diagrams for your HACCP plans	64	27	8	1

1.10	Are all food components and raw materials (including water) contained in the plan	89	7		4
1.11	Have you considered microbiological, chemical and physical hazards	89	7	3	1
1.12	Have you identified likely source(s) of the hazards	92	4	3	1
1.13	Has the possibility / potential for cross contamination been considered	93	1	3	3
1.14	Have you identified critical control points for each hazard	96	1	1	1
1.15	Does anyone hold a higher level hygiene qualification, i.e. above basic	66	32		1
1.16	Have you set target values for each CCP	67	27	4	
1.17	Have you stated critical limits for each CCP	83	14	3	
1.18	Is there a stated frequency for monitoring CCPs	87	11		1
1.19	Is there a stated procedure for monitoring CCPs	92	6	1	1
1.20	Have you trained relevant staff in monitoring CCPs	79	9		13
1.21	Are records kept of monitoring results	87	7		6
1.22	Do you keep monitoring equipment calibration records	75	25		
1.23	Are there appropriate corrective actions stated	93	5		1
1.24	Do corrective actions allow control of the product to be regained	90	4	4	1
1.26	Do your corrective actions name / specify person with responsibility for decision making	60	23	1	16
1.27	Are there detailed cleaning schedules with the HACCP plan	96	4		
1.28	Do you keep a record of staff illnesses	84	6		11
1.29	Are medical screening procedures in place for employees	33	51		15
1.30	Does the shop have a pest control policy	88	12		
1.31	Do you use external contractors to provide a preventative programme of pest control	58	38		4
1.32	Are critical limits of CCPs regularly / frequently exceeded	15	78	7	
1.33	Are your corrective action records in good, reliable condition and appropriate	92	1	4	3
1.34	Do you carry out checks on receipt of raw materials (e.g. temperature, date code, etc.)	100			
1.35	Do you record temperature of foods during storage	92	8		
1.36	Do you manufacture / process foods to documented recipes which include preservatives used	78	15	1	5
1.37	Do you record air temperature of display cabinets	84	12		4
1.38	Do cleaning schedules specify corrective action if cleaning is unsatisfactory	73	24		3
1.39	Do cleaning schedules specify the use of biocides (e.g. disinfectants, sanitisers, germicides)	89	11		
1.40	Do cleaning schedules specify how biocides are to be made up correctly	58	33		8
1.41	Do cleaning schedules specify a "contact time" for biocides	40	47	8	4
1.42	Do cleaning schedules specify the use of freshly made up biocides	43	43	7	7
1.43	Do cleaning schedules specify / include hand contact sites, e.g. telephones, handles	58	40	3	
1.44	Do cleaning schedules identify who is responsible for checking cleanliness	71	21	1	7
1.45	Do cleaning schedules specify the use of disposable or clean cloths / equipment / water	72	26	3	
1.46	Have you ever checked the effectiveness of cleaning and sanitising, e.g. using microbiological or rapid tests	23	76	1	
1.47	Have you a documented personal hygiene policy or staff rules for good hygiene	80	16		4

Observations					
2.1	Is monitoring carried out as specified in the HACCP plan	100			
2.2	Is the monitoring equipment in good working order with calibration certificates	68	25	6	2
2.3	Are raw materials stored appropriately	97			3
2.4	Are staff personal hygiene standards acceptable	90			10
2.5	Is cleaning correctly implemented	99		1	
2.6	Do you use separate probe thermometers to monitor raw and ready-to-eat foods	76	19		6
2.7	Do you strictly follow the processing / product recipe	90			10
2.8	Is monitoring performed as described in the HACCP plans	96		1	3
2.9	Are thermometer probes disinfected appropriately	93	3		4
2.10	Are surfaces in contact with cooling food visually clean	83			17
2.11	Are raw/ ready-to-eat foods de-bagged / unpacked separately	88			13
2.12	Are ready to eat goods separate from raw foods during display	94			6
2.13	Are staff handling cooked foods also handling raw foods	65	27		9
2.14	Are there common surfaces between raw and cooked areas (e.g. telephone, till, cloths)	58	38		4
2.15	Are clean utensils used to serve foods (e.g. tongs, bags, etc.)	90	3	1	6
2.16	Is bare hand contact with ready-to-eat food avoided (e.g. by use of gloves, bags, film)	84	10		7
2.17	Are surfaces used to display ready to eat food visually clean	92			8
2.18	Are high risk foods dispatched in a temperature controlled vehicle	54	10		37
2.19	Is your ready to eat food packaged to avoid cross contamination during dispatch	68	4	1	27
2.20	Is it impossible for equipment / utensils from low risk areas to find their way into high risk areas?	36	57	4	3
2.21	Do staff wear adequate / sufficient protective clothing (outer protection, head protection)	85	7	3	6
2.22	Is the wearing of protective clothing outside the business prevented	78	12	3	7
2.23	Do staff wash hands (soap and water) and dry at appropriate times, e.g. smoking, visiting the toilet, touching contaminated surfaces	93.2	1	1	4
2.24	Do you provide soap for handwashing	100			
2.25	Are disposable paper towels used for hand drying	88	12		
2.26	Are waterproof dressings available	97	1	1	
2.27	Do staff wear waterproof dressings when necessary	92	1	1	6
2.28	Do your staff have appropriate personal hygiene, e.g. hand habits, jewellery, protective clothing	89		3	9
2.29	Are surfaces in contact with food easily cleanable (smooth, joint free, impervious, good condition)	99	1		
2.30	Are high and low risk foods separated at all times	99			1
2.31	If staff move between high and low risk areas, do they wash their hands	82	6	1	11
2.32	Do you provide separate scales for raw and ready-to-eat foods	83	11		6
2.33	Are there separate chillers for raw and ready-to-eat foods	70	26		4
2.34	Are suitable sinks and facilities available for handwashing	100			
2.35	Are notices reminding staff of hand washing visible in relevant areas (near sinks, entrances, etc)	96	1		3
2.36	Is packaging from raw food disposed of promptly	97			3
2.37	Are notices concerning “no smoking” on display	80	16		4
2.38	Is food stored, where appropriate, off the floor and in vermin proof containers	97			3

2.39	Do premises allow sufficient work space to enable operations to be performed appropriately / hygienically	97	1	1	
2.40	Are there suitable and appropriate staff facilities	82	4		14
2.41	Are there any signs of pest infestation	7	90	1	1
2.42	Are there correctly operated and sited electric fly killers	93	7		
2.43	Are systems in place to minimise waste accumulation	97		1	1
2.44	Are external waste collection containers closed / covered/ Are there adequate systems for the collection / collation / disposal of waste	97	1		1
2.45	Is there evidence of rubbish / waste / packaging accumulating anywhere in the premises	7	90	1	1
Questions					
3.1	Has the HACCP plan(s) been audited / inspected / verified before	99	1		
3.2	Are new staff given appropriate instruction on the shops' HACCP plan	67	6	1	26
3.3	Have there been changes (e.g. products, processing, etc.) since the original HACCP plan	47	51	1	1
3.4	Have there been any changes, e.g. products, processes, staff, ownership, since the licence was granted	29	68		3
3.5	Are new staff provided with training within 12 weeks of starting	63	3		35
3.6	Were the HACCP plans developed by the owner with the help of a consultant after MLC training	81	17		1
3.7	Have any of the following also had an input into the HACCP plan construction, e.g. EHO, Industry Guide, other documents	63	32	2	3
3.8	Was MLC reference material used to set / identify critical limits	86	11	3	
3.9	Has the HACCP plan been reviewed annually	88	12		
3.10	Are staff prevented from working if ill	86	4		10
3.11	Have staff undertaken any refresher hygiene training	40	47		13
3.12	Have staff received training / instructions specifically on cross contamination	86	4		10

Table 3.2 indicates the 12 checklist questions or aspects of good practice, most frequently reported to be complied with. Four questions attracted 100% compliance, four 99% and four 97% compliance.

Table 3.3 lists ten aspects of food safety from the checklist which, if not implemented, could give rise to food safety concerns. These ranged from 77%, who had not checked the effectiveness of their cleaning schedules, using microbiological or other rapid tests, to 58% who admitted there could still be common surfaces between raw and cooked foods. Eight of these ten relate to aspects of cross contamination and decontamination (cleaning).

Table 3.2 Top twelve most frequent compliances from the self audit

Statement	Percentage
Is monitoring carried out as specified in the HACCP plan	100
Do you provide soap for handwashing	100
Are suitable sinks and facilities available for handwashing	100
Do you carry out checks on receipt of raw materials (e.g. temperature, date code, etc.	100
Has the HACCP plan(s) been audited / inspected / verified before	99
Is cleaning correctly implemented	99
Are surfaces in contact with food easily cleanable (smooth, joint free, impervious, good condition)	99
Do you have a documented HACCP plan	97
Are systems in place to minimise waste accumulation`	97
Are external waste collection containers closed / covered. Are there adequate systems for the collection / collation/ disposal of waste	97
Are waterproof dressings available	97
Is packaging of raw food disposed of promptly	97

Table 3.3 Ten most frequently reported checklist responses giving rise to food safety concerns

Statement	Percentage Yes	Percentage No
Have you ever checked the effectiveness of cleaning and sanitising, e.g. using microbiological or rapid tests	23	77
Are medical screening procedures in place for employees	33	67
It is impossible for equipment / utensils from low risk areas to find their way into high risk areas	36	64
Have staff undertaken any refresher hygiene training	40	60
Do cleaning schedules specify a “contact time” for biocides	40	60
Do cleaning schedules specify the use of freshly made up biocides	43	57
Are there separate chillers for raw and ready to eat foods	47	53
Are high risk food dispatched in a temperature controlled vehicle	54	47
Do cleaning schedules specify / include hand contact sites, e.g. telephones, handles	58	43
Are there common surfaces between raw and cooked areas (e.g. telephone, till, cloths)	58	42

3.2.2 Results of Self Audit Evaluation

Responses to the questions evaluating the self audit can be found in table 3.4. Sixty eight percent agreed or strongly agreed that an auditing system was a good idea, with 63% believing this should be done at least annually. Only 47% would use this particular audit checklist again. There was a large number

of ‘Don’t Knows’ with respect to whether the audit was too long, but among respondents who expressed an opinion, a slight majority liked it, but felt it was too long. Fifty eight percent claimed to use the original MLC audit checklist, which is very similar to the value (57%) from the questionnaire concerning the usefulness of the MLC audit. Respondents found the two sections to be more or less of equal value.

Table 3.4 Responses to questions concerning self audit evaluation

	(% cases)		
	Agree	Neither Agree Nor Disagree	Disagree
I found section 1 of the audit very useful	56	35	10
I think the idea of auditing systems is a good one	68	24	8
I would use this audit again in my shop	47	27	26
I think section 2 of the audit is a waste of time	23	30	48
I learnt a lot from completing the audit questions	24	37	37
I liked the audit but overall it took too long to complete	24	41	35
I use the original MLC checklist	58	22	20
I think all the shops should undertake this type of self auditing at least once a year.	63	22	15

3.2.3 Discussion

The response rate (11%) for the self audit was lower than for either of the questionnaires and lower than expected. The reason may be due to the length of time required and the effort needed to complete it. Whilst approximately 40% estimated it took less than 10 minutes to complete each individual section, some spent up to 2 hours to complete the whole audit. The length of time taken could be related to the size of the premises, extent and complexity of the HACCP plan, plus the familiarity of the person completing the form with their own documentation and working practices. From anecdotal comments it was perceived to take considerably longer to complete than either of the two questionnaires used in section 2. However, the responses overall represent the views of approximately 1% of butchers' shops in England.

A small minority of butchers (5%) claimed to have been refused a licence at some stage. Although not asked to specify circumstances, using data from

section 2 this would most likely have been the result of a re-inspection. It may be interesting to investigate how and why licences may be refused at time of re-licensing in further depth.

Respondents expressed an air of confidence about their HACCP plans, e.g. they could continue if key staff were missing, confidence with frequency and procedures for monitoring, possession of corrective action records, etc. However, it must be remembered these responses are self reported which may not always reflect reality (12). Other aspects of HACCP were less well implemented / considered, e.g. lack of step diagrams (27%), lack of setting target values (27%). HACCP is a specific risk management approach based on proactive prevention, e.g. making sure all the necessary control measures are in place, and monitored. It is perhaps significant that 15% claimed critical limits were regularly / frequently exceeded. For this to happen on a regular basis implies a certain lack of control or consistency in implementation even if it was followed by the appropriate corrective action.

Ninety three percent claimed to have considered cross contamination in the design of their HACCP plans, yet many of the answers to later questions, e.g. common hand contact surfaces and equipment and aspects of decontamination, suggested this may not have been very thorough.

These responses reflect other previous studies where respondents were often positive about preventing cross contamination as a general concept, but less supportive due to barriers, e.g. lack of time associated with the implementation of specific preventive measures (12, 17).

Some aspects of cleaning were poorly specified, e.g. lack of contact time. Previous studies have shown one of the most important reasons for failure to clean adequately was due to inadequate contact time (22). Also, hand contact surfaces were frequently omitted from cleaning schedules, and rarely were cleaning schedules validated or the effectiveness of cleaning checked appropriately (22, 23, 29). Other studies (22) have even shown that if cleaning is incorrectly / inadequately carried out, surface counts after cleaning can be higher than before.

Factors relating to effective cleaning and preventing cross contamination were, even in self report, often unlikely to be implemented and are a major component of Table 3.3.

Responses concerning temperature control / monitoring were generally better than for cross contamination, and this may be a reflection of a more deeply rooted culture of temperature measurement.

Further aspects of the self audit results are discussed in section 4.2.2 where comparisons are made between the self audit results and those of external auditors.

The use of self audit or self assessment, as with other sectors of the food industry, was generally approved of by butchers (68%). Fifty eight percent still use the short audit form provided in the MLC training pack.

3.3 Key Findings and Implications

Findings	Implications
1. Small minority (5%) have been refused a licence at some stage	The reasons for and mechanisms on how this happened may need further study
2. Some aspects of HACCP claimed to be well implemented, e.g. aspects of monitoring. Others, e.g. setting of target values and critical limits were not	Given that all premises were licensed, this may indicate a lack of understanding on some aspects of HACCP, variability in quality of HACCP plans or inconsistency of enforcement
3. Claimed self reported responses to temperature monitoring indicated a high level of compliance although monitoring equipment need not necessarily be in good working order with calibration certification (25%)	Could reflect a longer culture of temperature monitoring.
4. Although cross contamination was claimed to be considered in the design of HACCP plans, many responses indicated substantial remaining potential for it to occur	Greater emphasis on prevention of cross contamination required by EHOs. Butchers may need information on how to assess cross contamination in their premises and how barriers to preventing cross contamination can be overcome.
5. Aspects of cleaning were variable	Possible greater advice required and additional information about effective cleaning
6. The use of self audit is generally considered useful by butchers.	Use of audit checklists by butchers and EHOs could help improve consistency

4.0 Audit of Food Safety Practices and Management Systems

4.1 Introduction and Method

4.1.1 Introduction

The objectives of the study included the need to assess the quality of documentation, including HACCP plans and the level of compliance with them. Postal surveys have the advantage of distribution to large numbers of participants. However, respondents may be optimistic over their practices with a discrepancy between self reported practices and actual behaviour, additionally response rates can be low (12,29). Therefore, in order to fully evaluate documentation and adherence to it, an audit of butchers shops was undertaken. Data from this section are also linked and compared to the self audit data presented in Section 3.

4.1.2 Method

One hundred and twenty butchers' shops were audited. These were recruited from the list of licensed butchers supplied by local authorities (see 2.1.2) or from other specialist lists of butchers, e.g. MLC for Q Guild butchers. Three halal butchers were recruited directly via a local authority.

The audits were undertaken using a very detailed checklist (see Appendix 4). The checklist was constructed in relation to the Industry Guide to Good Hygiene Practice (Butchers' Shops Licensing Supplement). After construction it was further modified after submission to the FSA and after piloting in 5 butchers shops in Wales (Wales was not participating in the study). There were also questions relating to the implementation of pre-requisite programmes and HACCP in retail butchers, as well as questions concerned with the enforcement of the regulations and how the local authorities were controlling / regulating premises. The checklists also contained several sections which mirrored the "self audit" questionnaire (see section 4.2.2). This

allowed a comparison to be drawn between the butchers' opinions regarding their perceived level of compliance, and control and the auditors' opinion.

The audits were all undertaken by 2 auditors who carried out 4 joint pilot audits together. After each of these audits individual responses were recorded on the checklist compared and then discussed. This audit shadowing, combined with the use of a detailed checklist, the high level of qualifications and technical experience of the two auditors, helped to achieve inter auditor reliability. This resulted in consistency in the audit approach and agreement in audit data.

Every audit also confirmed that the shop had an up to date licence. The checklist can be broken down into three sections encompassing up to 200 questions, observations or checks which could be used in any one shop. The three sections were:

- ◆ Documentation and records
- ◆ Audit observations
- ◆ Questions for the company representative

Documentation:

The 85 detailed questions in this section covered the development and implementation of HACCP and the level of HACCP training that had been undertaken. This section also covered the documentation for PRPs used in conjunction with HACCP plans.

Documentation associated with all stages of the operation, from incoming goods through to retail sale, was also assessed. In those premises where the production of sausages / burgers was undertaken, documentation associated with both additive control and compositional control legislation requirements were also considered. Processing details of high risk products were also examined including auditing records of cooking and cooling and calibration records for temperature probes.

The observation phase of the audit (81 checks) covered all aspects of the operation, from receipt to sale. All storage areas were included, and all temperatures were monitored, using a calibrated probe, in storage freezers,

chillers and all display units. The standards of shop hygiene were also visually assessed and ATP and / or microbiological analysis was undertaken (see Section 5). One of the significant aspects for observation was to assess the risk of cross contamination. This included all areas of storage and display, the food handling and preparation practices, personal hygiene facilities and practices.

Other areas for study included pest prevention measures and waste disposal practices.

The final phase of the audit (34 questions) was a discussion with the person responsible for the HACCP controls to determine their level of knowledge and to ascertain their level of commitment. This stage also generated some anecdotal information that may be significant within the overall framework of the project.

During initial telephone requests for individual butchers to participate in the audit, hostility towards licensing and the FSA initiative was encountered. There was significant difficulty in obtaining participants for this study with the added problem of targeting specific groups, e.g. Halal, Q Guild, etc. A typical ratio of 15 rejections for each acceptance was encountered. It should be noted, therefore, that those butchers who agreed to participate may have to be considered as the 'better end' of the business spectrum, and that there could be bias in the results. The audits were undertaken from June to December 2002 in small cluster samples across England.

4.2 Results and Discussion of Auditors' Findings

4.2.1 Auditors' Findings

All of the butchers visited had a current licence, although not all were displayed. There is no requirement for this but it may be a useful way of informing the general public of the fact that a scheme for butchers exists.

In certain local authority areas butchers reported licences were being re-issued without any re-inspection and this was confirmed by one local authority. In order to comply with the requirement that butchers may not trade if unlicensed, when inspections had been undertaken after the expiry date of a licence, it was claimed by some butchers that new licences had been backdated.

No premises visited were perceived to present an imminent risk to food safety although standards of food safety did vary. Ninety six percent of premises visited had a documented HACCP plan with a further 3% stating they had a plan but either would not or could not show it to the auditor. One shop stated that they did not have a HACCP plan.

HACCP plans showed to auditors covered all products on sale. These were usually generic plans, with only two premises having a range of individual HACCP plans for specific products.

In developing HACCP plans, 50% of butchers had assistance from EHOs, 65% used industry guides for assistance. The MLC featured highly in HACCP development. In the majority of cases this links closely with the MLC manual “A Practical Guide to HACCP for Retail Butchers”. The MLC documentation was used to assist in HACCP implementation by almost 80% of butchers. This manual is specifically mentioned in the Industry Guide to Good Hygiene Practice: Butchers' Shop Licensing Supplement to the Retail Guide, and has obviously been used in conjunction with the MLC “Meat Managers HACCP Course” by the vast majority of licensed retail butchers. Over 90% of butchers audited had undertaken HACCP training, and all of those had used this MLC course, either directly through the MLC or in conjunction with local authorities' organised courses.

Many of the HACCP plans showed aspects of good practices, e.g. 87% of relevant staff trained in monitoring, 96% appropriate monitoring frequency. In a majority of the plans (90%) the potential for cross contamination had been considered. HACCP plans had often not been reviewed (34%), less than 50% specified potential customers and high risk groups. The equipment used for

monitoring CCPs generally consisted of temperature probes, although in over 50% of shops there was no evidence of calibration of this equipment. Those butchers who undertook calibration were, in fact, “accuracy checking” the equipment using iced water and boiling water, and accepted an approximate reading of close to 0°C and 100°C respectively, as an indication of suitability for use.

Incoming goods were generally subject to control in over 50% of shops, although delivery staff and vehicle hygiene was considered in only 25% of cases.

Production of sausages / burgers, etc. was undertaken in around 50% of premises, the majority of which did not directly control additives. In all cases, this linked to the use of pre-weighed seasoning mix, which already contains additives, although there was no evidence in any of the shops which processed that any checking was undertaken to prevent excess addition of the seasoning mix.

Cooking was undertaken in 75% of shops visited with temperature monitoring records available for all but one of the premises. In two further premises the records for at least one product (Roast Beef) were considered false as they recorded a core temperature of 72°C. The centre and surrounding area were clearly still pink in colour indicating that the myoglobin had not changed to metmyoglobin. For this type of product, a temperature of 72°C would normally have caused this colour change. All other temperatures recorded using the same probe were considered accurate and reliable

According to the Butchers’ Shop Licensing Supplement to the Retail Guide, “rare (cooked) beef and lamb should be safe, providing there is no contamination of the interior.....”. The guide also gives a range of equivalent processing time and temperature ranges which could be used by butchers to produce a “rare” product. The sale of “rare” beef is not a concern, but the fact that records show an “internal” temperature of 72°C probably indicates falsified records. This was a significant failing and as these products were part of the company’s standard range, and were prominently displayed, this should

have been noted during previous inspections. It was impossible to determine for how long this had been happening or if it had even been previously noted by an EHO.

A further concern is that almost 50% of shops did not have acceptable calibration records for probes used to monitor cooking.

In terms of goods on display in shops, the majority of butchers (81%) were monitoring the air temperatures, whilst only 28% were monitoring product temperatures. Although much of the guidance and regulation on this subject relates to the temperature of the foods, only 28% were actually measuring this.

With regard to cleaning regimes, it was noted that although cross contamination notes had featured in most HACCP plans, only 66% of butchers audited specified hand contact sites on their cleaning regimes. Cleaning schedules themselves were generally used in shops although there were some concerns over their quality. In 30% of shops audited they did not adequately cover responsibility for cleaning. In 75% of shops, cleaning had not been validated. The majority of the shops (95%) were operating a clean as-you-go policy .

It was noted that in over 33% of shops the same probe was used to monitor cooked and raw foods. In 3 shops the antibacterial wipes for probe disinfection, mainly alcohol based, were very dry suggesting that the alcohol base had evaporated and therefore the efficiency of these wipes must be questioned. Probe disinfection was considered inadequate in 13% of premises. The same staff handled raw and cooked foods in over 70% of premises. In 75% of shops there was also common hand contact surfaces, e.g. till, telephone, etc. for cooked and raw food areas. Cumulatively these contribute to cross contamination and the spread of organisms within shops.

Handwashing facilities were generally well equipped, although in 10% of shops there was no soap available. Hand drying was undertaken using disposable paper towels in over 80% of cases however, it was observed that in 20% of cases staff moving between high and low risk foods did not wash their

hands adequately. In 80% of the premises visited, the taps on hand wash sinks were hand operated with the remainder using either a foot or knee lever or an infra-red sensor. In 66% of shops, hand contact sites were specified in the cleaning regimes, observation during the audit and microbial examination, results however, suggest that these were not being effectively cleaned.

During the audits it was noted in 20% of premises that the separation of cooked and raw foods, either in storage or display, was not of a satisfactory standard. This included open storage of raw and cooked foods in close proximity with no adequate barrier. In 15% of cases the same weighing scales were used for raw and cooked foods, although raw and cooked foods were never placed directly on the scales in the presence of auditors.

Table 4.1 External auditors' responses to checklist questions

Question No:	Questions	Percentage			
		Compliance	Non Compliance	Not Applicable	Not Assessed
Documentation / Records					
1	Does the shop hold a current licence	100			
2.1	Does a documented HACCP plan exist	96	1		3
2.2	Are all products covered by the HACCP plan(s)	96	1	1	1
2.3	Are products grouped generically within the plan(s)	94	3	2	2
2.4	Have any of the following also had an input into the HACCP plan construction:				
2.4.1	EHO	55	36		9
2.4.2	Industry Guide	71	22	6	2
2.4.3	Other documents	32	58	6	4
2.4.4	Was MLC documentation used in the identification of critical control points	83	13		4
2.4.5	Was the consultant used to help identify CCPs	79	12	6	3
2.4.6	Was MLC reference material used to set / identify critical limits	85	10		4
2.5	Can the HACCP plan be implemented even if a key member of staff is away	75	9	15	2
2.6	Has the HACCP system been reviewed since signing off by the consultant	62	34		4
2.7	Have changes been made to the HACCP plan since initial formulation	71	9	16	4
2.8	Have you records on any of the above changes	33	13	49	4
2.9	Does the plan identify potential customers and high risk groups	49	47	3	2
2.10	Is there a flow diagram	75	23		1
2.11	Is the flow diagram of an appropriate standard	70	9	17	4

2.12	Are all food components and raw materials (including water) contained in the plan	75	7	13	4
2.13	Does the flow diagram contain all appropriate steps as far as can be determined	73	4	17	6
2.14	Have all hazards been considered for that type of product	87	9		4
2.15	Has the likely source(s) of the hazards been identified	85	10		4
2.16	Has the possibility / potential for cross contamination been considered	96	1		3
2.17	Have appropriate / realistic and validated control measures been identified for each hazard	93	6		1
2.18	Have critical control points been identified for each hazard	96	3		1
2.19	Are “industry accepted” target values selected for each CCP	93	6		2
2.20	Are critical limits stated for each CCP	93	6		1
2.21	Is there a stated frequency for monitoring	84	15		2
2.22	Is there a stated procedure for monitoring	84	15		1
2.23	Have relevant stated staff been trained in monitoring	87	9	4	
2.24	Does monitoring provide real time data	94	3		1
2.25	Is monitoring frequency appropriate	96	3		1
2.26	Are records kept of monitoring results	96	3		2
2.27	Are records kept for calibration of monitoring equipment	50	49	2	
2.28	Are there appropriate corrective actions established and specified if monitoring indicates ‘critical limits’ exceeded	90	9		2
2.29	Do corrective actions allow control of the product to be regained	90	3	6	2
2.30	Do corrective actions specify what is to be done with food produced since monitoring last indicated “in control”	81	12	6	1
2.31	Does corrective action name / specify person with responsibility for decision making	54	29	15	3
2.32	Should the HACCP plan have been reviewed (has it been more than 12 months since the last review)	61	29	10	
2.33	Are details of relevant Pre-Requisite Programmes (PRPs) provided with the HACCP plan (eg: cleaning schedules etc)	86	15		
2.34	Are any basic hygiene certificates available for inspection	93	7		
2.35	Does the person in charge hold a higher level of hygiene qualification	33	66	2	
2.36	Has any food handler completed a HACCP course	96	4		
2.37	Have any food handlers received higher levels of hygiene training	33	67		
2.38	Are the following checks made on receipt of raw materials:				
2.38.1	delivery temperature	82	18		
2.38.2	date codes	62	36	1	
2.38.3	condition (including packaging integrity)	58	42		
2.38.4	supplier code	59	41		
2.38.5	delivery staff personal hygiene	26	74		
2.38.6	vehicle hygiene	28	73		
2.39	During storage, are the following recorded:				
2.39.1	temperature	96	4		
2.39.2	stock rotation / date codes	64	36		
2.40	During processing are the following recorded:				
2.40.1	brine concentration	9	22	70	
2.40.2	nitrate/nitrite levels	13	26	61	
2.40.3	SO ₂ levels	35	20	45	
2.40.4	cooking time/ temperature	75	1	23	

2.40.5	thermometer probe calibration	48	44	9	
2.40.6	Cooling temperature / times	62	15	23	
2.41	During display/sale are the following recorded:				
2.41.1	temperature/time of hot hold products	9		91	
2.41.2	temperature of goods on display	30	65	4.3	
2.41.3	air temperature of display cabinets	87	12	1	
2.42	Is the monitoring equipment in good working order with calibration certificates	58	39		3
2.43	Are monitoring records in good condition / appropriate	90	7		3
2.44	Do cleaning procedures specify corrective action if cleaning is unsatisfactory	49	46	4	
2.45	Do cleaning schedules specify the use of biocides (e.g. disinfectants, sanitisers, germicides)	55	42	3	
2.46	Do cleaning schedules specify how biocides are to be made up correctly	26	57	17	
2.47	Do cleaning schedules specify a "contact time" for biocides	4	80	16	
2.48	Do cleaning schedules specify the use of freshly made up biocides	4	78	17	
2.49	Do cleaning schedules specify / include hand contact sites	71	25	4	
2.50	Do cleaning schedules identify who is responsible for checking cleanliness	46	45	9	
2.51	Do cleaning schedules specify the use of disposable or clean cloths / equipment / water	43	50	6	2
2.52	Do cleaning schedules contain information on:				
2.52.1	methods	78	17	4	
2.52.2	materials	81	13	4	
2.52.3	frequency	91	4	4	
2.52.4	responsibility	57	33	10	
2.52.5	monitoring	62	34	4	
2.52.6	health and safety	42	52	4	1
2.53	Has the effectiveness of cleaning and sanitising been validated	19	81		
2.54	Is there a documented personal hygiene policy	77	20	1	1
2.55	Is a record kept of staff illnesses	64	23	10	3
2.56	Are medical screening procedures in place for employees	65	17	13	3
2.57	Does the shop have a pest control procedure (ie internal control systems or an external contract)	77	23		
2.58	Are external contractors used to provide a preventative programme of pest control	38	46	16	
2.59	Are there records of waste disposal where appropriate (ie: licensed waste contractors)	88	5	2	6
2.60	Are critical limits of CCPs regularly / frequently exceeded	96	1		3
2.61	Are corrective action records in good, reliable condition and appropriate	85	7	3	4
Observations					
3.1	Are all raw materials stored appropriately (food and non food)	92	8		
3.2	Are staff personal hygiene standards acceptable	93	6		1
3.3	Does cleaning of the premises and equipment appear to be adequate	96	4		
3.4	Are separate probe thermometers used to monitor raw and ready-to-eat foods	57	37	4	2
3.5	Do processing staff strictly follow the processing / product recipe	62	6	25	7
3.6	Is the person doing the monitoring appropriate to do so	97		3	
3.7	Is monitoring performed at the correct location (in the premises)	97	1		1

3.8	If critical limits exceeded, are corrective actions implemented as described in the HACCP plan	78	3	6	13
3.9	Are thermometer probes disinfected appropriately	68	13	12	7
3.10	Is the cooking equipment maintained appropriately	71	2	25	3
3.11	Are surfaces in contact with cooling food in good condition	75	3	21	2
3.12	Are surfaces in contact with cooling food visually clean	76	21		3
3.13	Are raw/ ready-to-eat foods de-bagged / unpacked separately (either physically or time)	97		2	2
3.14	Are ready to eat goods on display separate from raw foods	85	9	4	2
3.15	Are staff handling cooked foods also handling raw foods	17	78	4	
3.16	Are there common hand contact surfaces for raw and cooked foods (e.g. telephone, till, cloths)	15	83	3	
3.17	Are clean utensils used to serve foods (e.g. tongs)	75	9	12	4
3.18	Is a 'no hand touch' policy in operation for serving cooked products	73	17	6	4
3.19	Are display surfaces visually clean	97	3		
3.20	Is dispatch of high risk foods in a temperature controlled vehicle (if any deliveries are undertaken)	20	9	70	1
3.21	Is the interior of the vehicle in clean condition	9		75	16
3.22	Is ready to eat food packaged to avoid cross contamination during dispatch	39	7	49	4
3.23	Are the packaging materials as described in the HACCP plan	22	44	20	15
3.24	Is storage of end product as described in the HACCP plan	81	4	9	6
3.25	Is a "clean as you go" policy in operation	100			
3.26	Is drying performed using air / disposable items (e.g. paper towels)	80	13	1	6
3.27	Are separate cleaning materials used for high and low risk operations	28	63	7	2
3.28	Are cleaning equipment / utensils colour coded for high and low risk areas	44	44	13	
3.29	Is it impossible for equipment / utensils from low risk areas to find their way into high risk areas?	9	75	15	1
3.30	Do staff wear adequate / sufficient protective clothing (outer protection, head protection)	75	23	1	
3.31	Is the wearing of protective clothing outside the business prevented	68	9	3	20
3.32	Do staff wash hands (soap and water) and dry after the following:				
3.32.1	visiting the toilet	84			15
3.32.2	smoking	64		22	15
3.32.3	blowing nose	81	1		17
3.32.4.1	touching : raw food	81	10	1	7
3.32.4.2	bins / bin lids	75	7	4	13
3.32.4.3	raw food packaging	3	10		7
3.32.4.4	other contaminated objects	83	6	1	10
3.33	Is soap/handwash preparation used for handwashing	97	3		
3.34	Are disposable paper towels used for hand drying	87	13		
3.35	Is bare hand contact with ready-to-eat food avoided (e.g. by use of gloves, bags, film)	73	17	7	1
3.36	Are waterproof dressings available	87	1	10	1
3.37	Do staff wear waterproof dressings when necessary	81	3	1	15
3.38	Were acceptable procedures observed with respect to:				
3.38.1	handwashing	86	4	9	
3.38.2	hand habits (eg nail biting)	91	1		7

3.38.3	cuts / grazes	86		4	10
3.38.4	wearing jewellery	91	4		4
3.38.5	smoking	71		10	17
3.38.6	eating / drinking	83	7		10
3.38.7	protective clothing	94	1		3
3.39	Are premises constructed of easily cleanable materials and finishes	96	4		
3.40	Are surfaces in contact with food easily cleanable (smooth, joint free, impervious, good condition)	98	1		
3.41	Are premises designed to separate high and low risk foods	78	16	6	
3.42	Are high and low risk foods separated at all times	74	23	3	
3.43	Do the same staff work in high and low risk areas	21	73	6	
3.44	If staff move between high and low risk areas, do they wash their hands	67	20	9	4
3.45	Are there separate scales for raw and ready-to-eat foods	79	16	4	
3.46	Are there separate chillers for raw and ready-to-eat foods	49	45	6	
3.47	Are raw and ready-to-eat foods adequately separated during display	87	7	6	
3.48	Are suitable sinks and facilities available for handwashing:				
3.48.1	on entering the meat preparation area	90	10		
3.48.2	in toilets	78	19	2	2
3.48.3	near to where raw foods are handled	93	7		
3.48.4	near to where ready-to-eat foods are kept	78	18	4	
3.49	Are sinks equipped with “no hand contact” taps	16	84		
3.50	Are notices reminding staff of hand washing visible in relevant areas (near sinks, entrances, etc)	90	10		
3.51	Is packaging from raw food disposed of promptly	96	1		3
3.52	Is food stored where appropriate, off the floor and in vermin proof containers	97	3		
3.53	Is raw food stored in a way designed to prevent contamination of food, people and surfaces	97	3		
3.54	Is the site maintained so as to prevent contamination	96	4		
3.55	Are premises designed, constructed and maintained to minimise contamination with respect to product and work flow	96	4		
3.56	Do premises allow sufficient work space to enable operations to be performed appropriately / hygienically	99			1
3.57	Are there suitable and appropriate staff facilities	81	10		9
3.58	Are there any signs of pest infestation	88	12		
3.59	Are raw materials, packaging, etc. stored to minimise pest infestation	100			
3.60	Can pests readily gain access to the premises	87	13		
3.61	Are there correctly operated and sited electric fly killers	79	21		
3.62	Is waste allowed to accumulate internally / externally in an unacceptable manner	97	3		
3.63	Are systems in place to minimise waste accumulation	97	1	1	
3.64	Are external waste collection containers closed / covered/ Are there adequate systems for the collection / collation / disposal of waste	96	1		3
3.65	Is there evidence of rubbish / waste / packaging accumulating anywhere in the premises	99	1		
3.66	Are the PRPs correctly implemented as described in the associated documentation	84	12	1	3
Questions					
4.1	Is there evidence of owner commitment and support for HACCP	93	7		
4.2	Has the HACCP plan(s) been audited / inspected / verified before	86	15		

4.3	Have all remedial works recommended by the previous question been implemented	75	3	20	1
4.4	Are new staff given additional instruction in the shops' HACCP plan or aspects of their work which would contribute to food safety	67	4	28	1
4.5	Have any of the following taken place since the initial HACCP plan:				
4.5.1	Changes of recipe	65	4	29	1
4.5.2	New product	51	20	28	1
4.5.3	New equipment	57	13	30	
4.5.4	New process	63	7	29	
4.5.5	New staff	38	22	39	1
4.5.6	New activities	59	7	33	
4.5.7	New information on hazards and risks	1	3	96	
4.5.8	Change in processing / production layout	59	3	38	
4.6	Have any of the following taken place since the licence was granted:				
4.6.1	Changes of recipe	71	3	27	
4.6.2	New product	63	9	27	2
4.6.3	New equipment	62	7	28	3
4.6.4	New process	66	3	29	2
4.6.5	New staff	42	19	36	3
4.6.6	New activities	95	2	34	
4.6.7	Change in processing / production layout	69		29	2
4.6.8	New information on hazards and risks	16	3	79	2
4.6.9	A change of ownership	29	4	67	
4.6.10	Other changes that could affect food safety	20	3	77	
4.7	Are new staff provided with training within 12 weeks of commencement	49	4	42	4
4.8	If new staff have existing qualifications are these evaluated or assessed for accuracy and awareness	52	3	41	4
4.9	Was the HACCP plan developed by the owner with the help of a consultant after MLC training	88	6	4	1
4.11	Have any of the following been used to identify corrective action:				
4.11.1	EHO	59	31	10	
4.11.2	Consultant	75	16	9	
4.11.3	MLC documents	78	9	12	
4.11.4	Industry Guidelines	39	49	12	
4.11.5	Others	22	47	31	
4.12	Was the original (or subsequent amendments to) HACCP plan validated (ie are controls capable of achieving their objective)	78	19	3	
4.13	Has the HACCP plan been reviewed annually	64	32	4	
4.14	Are staff prevented from working if ill	86		10	4
4.15	Have staff received training / instructions specifically on cross contamination	93	6		2

4.2.2 Comparison of Auditors Findings with Self Audit

Table 4.2 contains a comparison of 28 key findings obtained from self and external audit, although useful it should be recognised responses were

obtained in a different way and from different sample populations. The questions are grouped into 4 sections dealing with general aspects, HACCP, cross contamination and cleaning. The magnitude of the difference ranged from 1% to 51%. Of interest is that the greatest difference concerned staff handling both raw and cooked foods. External auditors assessed this happening in 78% of businesses, compared with only 27% from self assessment.

Table 4.3 contains a list of audit checklist questions common to self audit and external audit where the responses were significantly different. One, relating to use of medical screening procedures, was underestimated by self audit. All of the others were over estimates from self audit.

Table 4.2 Comparison of audit and self-audit results, in assessing good food safety practices

Statement	% Responses	
	Audit	Self-Audit
General		
Does your shop hold a current licence	100	100
Are systems in place to minimise waste accumulation	97	97
Are external waste collection containers closed / covered/ Are there adequate systems for the collection / collation / disposal of waste	96	97
Are waterproof dressing available	87	97
Are medical screening procedures in place for employees	65	33
HACCP		
Are critical limits stated for each CCP	93	83
Has the HACCP plan(s) been audited / inspected / verified before	86	99
Is there a stated procedure for monitoring CCPs	84	92
Do you have a documented HACCP plan	96	97
Does corrective action name / specify person with responsibility for decision making	54	60
Are records kept for calibration of monitoring equipment	50	75
Cross Contamination		
Is packaging from raw food disposed of promptly	96	97
Has the possibility / potential for cross contamination been considered	96	99
Are ready to eat goods on display separate from raw foods	87	94
Are there separate scales for raw and ready to eat foods	79	83
Is bare hand contact with ready to eat food avoided (e.g. by the use of gloves, bags, film etc.)	73	84
If staff move between high and low risk areas, do they wash their hands	67	82
Are high and low risk foods separated at all times	74	99
Are there separate chillers for raw and ready-to-eat foods	49	70
Are staff handling cooked foods also handling raw foods	78	27

Are there common hand contact surfaces for raw and cooked foods (e.e. telephone, till, cloths)	83	58
Is it impossible for equipment / utensils from low risk areas to find their way into high risk areas	9	36
Cleaning		
Are surfaces in contact with food easily cleanable (smooth, joint free, impervious, good condition)	98	99
Do cleaning schedules specify / include hand contact sites	71	58
Do cleaning procedures specify corrective action if cleaning is unsatisfactory	49	73
Have you ever checked the effectiveness of cleaning and sanitising, e.g. using microbiological or rapid tests	19	23
Do cleaning schedules specify the use of freshly made up biocides	4	43
Do cleaning schedules specify a “contact time” for biocides	4	40

Table 4.3 Statements which differ significantly between audit and self audit responses

Statement
Has the HACCP system been reviewed since signing off by the consultant
Are records kept for calibration of monitoring equipment
Do cleaning procedures specify corrective action if cleaning is unsatisfactory
Do cleaning schedules specify the use of biocides (e.g. disinfectants, sanitisers, germicides)
Do cleaning schedules specify how biocides are to be made up correctly
Do cleaning schedules specify a ‘contact time’ for biocides
Do cleaning schedules specify the use of freshly made up biocides
Do cleaning schedules identify who is responsible for checking cleanliness
Do cleaning schedules specify the use of disposable or clean cloths / equipment / water
Are medical screening procedures in place for employees
Are separate probe thermometers used to monitor raw and ready to eat foods
Are thermometer probes disinfected appropriately
Are ready to eat goods on display separate from raw foods
Is it impossible for equipment / utensils from low risk areas to find their way into high risk areas
Do staff wear adequate / sufficient protective clothing (outer protection, head protection)
Are high and low risk foods separates at all times
If staff move between high and low risk areas, do they wash their hands
Are there separate chillers for raw and ready to eat foods
Are there correctly operated and sited electric fly killers
Has the HACCP plan(s) been audited / inspected / verified before
Has the HACCP plan been reviewed annually

4.2.3 Discussion

Considerable difficulty was encountered in recruiting butchers to participate in the auditing. This was anticipated as it involved the butchers' time and trouble and a commitment which could have detracted them from their routine work of selling meat. Each audit took an average 2.5 hours. However, it became obvious from an early stage that there was still a legacy of butchers' feeling "picked on", and while the origin of licensing lay with the Pennington Report, some of the butchers expressed negativity directed at the FSA itself.

The audits undertaken at 120 shops across England showed a wide range of standards. None of the shops visited were considered to present an imminent risk to food safety, although there were several occasions where legislative infringements were noted, e.g. product temperature control. Licensing and re-licensing were noted to vary between local authorities. The Food Safety (General Food Hygiene) (Butchers' Shops) Amendment Regulations 2000 do not specify that an audit is required before a licence is re-issued, however the validity of HACCP plans and ensuring continued compliance with all legislation is probably more easily established with an inspection. There is scope for the licensing arrangements to be more consistent throughout all local authority areas.

Although only 5% of the premises audited were "ethnic" butchers, the level of risk in all was regarded by the auditors as very low. Only one of the premises was manufacturing any meat preparations – raw only. None of these premises was selling unwrapped cooked products and were only subject to the licensing requirement because they sell tinned ready to eat foods. Practices observed during the audit did not indicate that there was any food safety risks associated with any of the food on sale in these premises, and the auditors were of the opinion that these premises should not be considered as requiring a licence. This would not apply solely to "ethnic" butchers but any shop selling this combination of foods. Information obtained in discussion with some EHOs suggests that, particularly within the London boroughs, there are some local

authorities who are not including these premises on their list of shops to be licensed.

Many aspects of the HACCP plans / documentation developed, as a result of the MLC initiative, showed elements of good practice, e.g. monitoring frequency. There were however, several areas within retail butchery premises that did give rise to food safety concerns and many of them link to cross contamination risks. Handwashing practices and facilities were not always of a high standard. and taps particularly carried a potential for contamination. The costs of fitting non-hand operated taps depending upon existing facilities, can be less than £100 and not too time consuming.

Whilst it is recognised decontamination of probes can be effectively implemented, additional probe thermometers, allowing separate equipment for raw and cooked, can be purchased for between £20 - £150. This cost is minimal in relation to the ongoing costs within most butchers' shops.

Table 4.4 Comparison of present findings to some other published data

	Walker and Jones	UWIC
No probe disinfection	7%	12%
Inadequate handwashing	7%	10%
Inadequate separation of cooked / raw foods	31%	22%
No food handlers exclusion policy	7%	10%

The results of the audit and self audit differed to some extent. This could have been for a number of reasons e.g. a different sample population or different practices, Also, an audit is a snapshot in time of the practices used when the auditor is there and measures a slightly different perspective to self audit. However, optimism in the self reporting of food safety practices has been noted elsewhere (12), it therefore seems likely that external auditing provides a more accurate picture than the self assessment. However, in spite of the differences, common trends relating to: documentation, e.g. lack of calibration certificates; hygiene practices and cross contamination, e.g. common surfaces for raw and cooked foods could be identified

Table 4.4 compares key areas of data obtained for this project to recently published results from elsewhere. Previous research by Walker and Jones (2) identified several key areas of concern within their study of 29 butchers.

While there were several areas which had improved in the interim, there were many areas which still gave some cause for concern.

Finally, although the majority of the shops can be regarded as having acceptable food safety control systems, the auditors note that there was a greater sense of understanding within those premises which had been operating documented food control systems for a long time before they became legislative requirements. Several of the premises were of a significantly higher standard, and these were often owned by butchers who had “always done this type of thing but had never written it down”. An example of this were the Q Guild shops, who all tended to be at the higher end of compliance levels. This suggests that standards in other butchers may continue to improve with practice and experience.

Overall the auditors, who have had many years experience in the meat industry, were of the opinion that the general standards in the shops were satisfactory and had improved within the past few years. This is likely to be linked to several factors, including food scares, more demanding consumers, etc., but must also be as a result of the licensing initiative to a certain extent. In order to maintain the improvements some consideration should be given to offering more training and consultancy to this sector, particularly with regard to verifying and reviewing HACCP documentation, and greater knowledge of cross contamination risks and mechanisms for their control.

Overall the findings from the two studies indicate a similar pattern.

4.3 Key Findings and Implications

Findings	Implications
1. No premises audited were considered to pose an imminent risk to food safety	
2. All shops had a licence, although there was variation in how local authorities undertake their work	A lack of consistency by local authorities
3. There was considerable variation in the standard of food hygiene, within the shops that were audited although some indicated elements of good practice including documentation associated with HACCP	A lack of consistency by local authorities Indicates it is possible to implement HACCP in butchers' shops
4. HACCP plans were not being reviewed in many shops (32%) and often did not have a step diagram (23%)	Validity of the plans, monitoring and control measures. HACCP plans being used solely as a means of gaining a licence rather than controlling food safety
5. Checks at time of receipt of raw materials were often poor (e.g. no check on delivery hygiene in approximately 75% of cases)	
6. Temperature monitoring procedures and accuracy of temperature monitoring equipment was not unknown in a number of premises. One instance where the records may not have been accurate	Validity of the records could be questioned and, in premises which cook product, there could be a potential for insufficient cooking. There may also be potential for cross contamination with the probe as the vehicle
7. Considerable potential for cross contamination still existed in many shops and standards of hand hygiene could be improved. Many premises were not designed to minimise cross contamination	Ready to eat foods may still be subject to cross contamination.
8. Facilities for hand hygiene, e.g. non hand contact taps, could be considerably improved, especially given the number of staff who serve both raw and cooked products or share facilities.	This is a clear vehicle for cross contamination. The microbiological results confirm that this area is not always being satisfactorily cleaned. Relatively simple improvement could reduce the cross contamination threat.
9. In over 10% of cases, staff are not precluded from working if ill	There is a likelihood that infected staff could be responsible for other staff becoming ill, and perhaps more importantly, infecting ready to eat foods.

5.0 Surface Cleanliness and Contamination Levels

5.1 Introduction and Method

5.1.1 Introduction

Cross contamination has been identified as an important contributory factor in food poisoning outbreaks (18). Raw meat and poultry are known to be a good source of microorganisms and the soiling of equipment and surfaces is unavoidable during the preparation of products for display and sale. Raw meat, especially minced, can be contaminated with *E.coli* O157 which can have a minimum infective dose of less than 100 bacteria (22). The soiling of cloths, hands and utensils on food product environments is well documented, and their potential to cross contaminate surfaces used for cooked products is well recognised (8).

Raw poultry (and its packaging) sold by many butchers is known to be frequently contaminated with *Campylobacter* and to a lesser extent *Salmonella* (17). Cross contamination is thought to be particularly important in the aetiology of *Campylobacter* and studies have shown that handling raw poultry can quickly spread the bacterium to a wide range of other hand and food contact surfaces (20). Clean hands can easily be contaminated after touching soiled surfaces and then further transmit microorganisms to ready to eat foods or their packaging (21). One study indicated RTE foods were more likely to be touched by hands than any other surface, additionally hands may harbour *Staphylococcus aureus*, a known food poisoning organism (23).

Good hand hygiene, coupled with separation of raw foods from cooked, and a well managed cleaning programme can be effective in preventing cross contamination. A measure of the effectiveness of these prevention strategies is the level of surface cleanliness within butchers' shops.

5.1.2 Method

An opportunistic / convenience sample of the randomly recruited butchers who were audited (section 4) was also assessed for levels of surface contamination. Butchers agreeing to be audited were further asked if they would be prepared to have surfaces within their shops checked. A total of 63 (approximately 50% of those audited) agreed. As far as possible, a structured approach to sampling was undertaken (see Appendix 5) although the precise surfaces sampled depended upon design and layout of premises, timing and opportunity, plus any concerns of the auditor or the auditee.

A range of food, hand contact and other surfaces were visually assessed using ATP bioluminescence and microbiologically using dip slides. Visual assessment recorded surfaces as visibly clean or dirty, moist or dry and whether rough or smooth. Wetness / dryness of surfaces is important as moist surfaces can enhance survival of microorganisms but possibly of even greater importance they facilitate cross contamination (23). Smooth surfaces are defined as “even, regular surfaces free from projections” and easily cleanable. Rough surfaces could be due to poor surface condition or design, e.g. scoring, or have cracks / crevices where food could accumulate.

Visual assessment is known to be a poor indicator of surface cleanliness and therefore ATP and microbiological examinations were also undertaken. ATP measures organic debris (of food and / or microbiological origin) and is therefore a better measure of cleanliness per se. Dip slides measure surface bacterial contamination, and therefore are a reflection of the surface microbial load and / or the degree of disinfection at any given time. Results of the tests themselves are presented and additionally classified as pass / fail in relation to criteria for clean surfaces. The latter used previously, obtained bench mark values ($<2.5\text{cfu}/\text{cm}^2$ and <500 RLU for ATP) (21,22,23). The main advantage of ATP over microbiological tests is that results can be obtained in seconds. ATP can also be more sensitive in sampling drier surfaces (26). The disadvantage is that currently the test does not inform if a high ATP reading is of microbial or non-microbial origin.

5.2 Results and Discussion

5.2.1 Results

Overall up to 575 surfaces were tested in 63 butchers' premises. Surfaces are considered in three parts: food contact, hand contact and other. The latter could include wiping cloths, aprons, etc. Table 5.1 indicates surface condition, i.e. rough: smooth.

Table 5.1 Condition of Surfaces

	n	%
Overall	345	100
Rough	49	14
Smooth	296	86
Food Contact	178	52
Rough	1	<1
Smooth	177	99
Hand Contact	129	37
Rough	13	10
Smooth	166	90
Other	38	11
Rough	35	92
Smooth	3	8

The majority of surfaces were smooth (86%) with surfaces classified as “other” most likely to be rough (92%).

Table 5.2 indicates whether the surfaces were classified as moist / dry. Overall 75% of surfaces were classified as dry. Food contact surfaces were most likely to be dry with “other” surfaces least likely. Thirty one percent of hand contact surfaces were classified as moist.

Table 5.3 indicates surfaces assessed as visually clean or dirty.

Table 5.2 Presence or absence of moisture on surfaces

	n	%
Overall	352	100
Moist	86	24
Dry	266	75
Food Contact	176	50
Moist	9	5
Dry	167	95
Hand Contact	128	36
Moist	40	31
Dry	88	69
Others	48	14
Moist	37	77
Dry	11	23

Table 5.3 Surfaces assessed visually as clean or dirty

	n	%
Overall	346	100
Clean	219	63
Dirty	127	37
Food Contact	161	47
Clean	131	81
Dirty	30	19
Hand Contact	131	38
Clean	62	47
Dirty	69	53
Others	54	16
Clean	26	48
Dirty	28	52

Overall 63% of surfaces were assessed as visually clean. Food contact surfaces were most likely to be clean (81%) with hand contact surfaces least likely (47%).

Table 5.4 contains ATP data by specific sites. Also included is the percentage of each site in excess of the clean benchmark values.

Table 5.4 ATP values at specific sites

	Mean ATP	Range	Number of Site Tests	% of Sites Classified as Clean
<u>Food Contact</u>				
Display Surfaces RTE	1352	68-10,274	14	43
Slicer Blade RTE	16,053	799-93,272	14	0
Trays for RTE	3173	623-7507	6	0
Scale for RTE	97,346	19- >500,000	6	50
Preparation Surfaces RTE	65,433	73-191,200	3	33
<u>Hand Contact</u>				
Hot Tap - Sink	11,026	397-75,342	37	3
Hot Tap – Hand Wash Basin	15,041	259-47,044	9	14
Chiller Door Handle	29,327	1011-124,943	5	0
Till Keys	4583	73-33,081	22	5
Phone	2743	448-6533	18	6

Table 5.5 Aerobic Colony Counts of specific sites

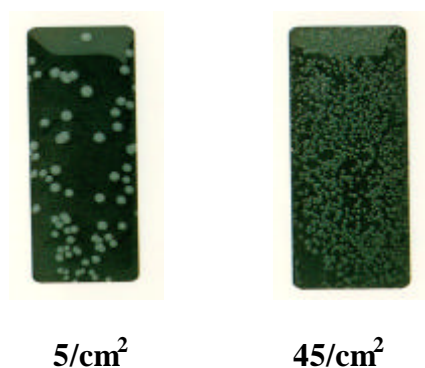
Type of Surface	Mode cfu/cm ²	Range	Number of Sites Tested	% of Sites Classified as Clean	% Sites 12 or >12cfu
<u>Food Contact</u>					
Display Surface RTE	2.5cfu	<2.5-100	26	4	46
Slicer Blade RTE	2.5cfu	<2.5-40	28	14	36
Tongs for RTE	2.5cfu	<2.5-2.5	9	22	0
Scale Pan RTE	2.5cfu	<2.5-40	33	6	30
Preparation Surface RTE	2.5cfu	<2.5-100	18	0	61
<u>Hand Contact</u>					
Hot Tap - Sink	12cfu	-	1	0	100
Hot Tap – Hand Wash Basin	2.5cfu	2.5-100	4	0	50
Chiller Door Handle	2.5cfu	2.5-40	4	0	50
Till Keys	2.5cfu	<2.5-40	15	13	20
Phone	12cfu	2.5-40	4	0	75

For food contact surfaces, ATP values were highest on the scales used for weighing RTE products. However, as the ATP test is not specific this could have been reading organic matter / debris mainly of food origin. The maximum reading of the instrument is 500,000 RLUs with values in excess representing overload. This only occurred once and was on a scale pan. It is not uncommon for scale pans to have visual food debris from previous servings present.

Of more concern is the level of ATP found on hand contact surfaces, as this is usually not derived from gross food soiling. A previous study (24) has indicated that for hand contact surfaces, typically, 33% of ATP is of microbial origin. Three hand contact surfaces tested (hot taps, chiller door handles) indicated considerable soiling with mean values of 11,000, 15,000 and 29,000 respectively. Maximum values obtained from the same sites were 75,000, 47,000 and 125,000 Relative Light Units (RLUs) respectively indicating for these surfaces, some premises, had very high levels of ATP. Relatively few would be classified as clean using ATP benchmark values.

Tables 5.5, 5.6 and 5.7 contain comparative data from the same surfaces for aerobic colony counts, enterobacterial counts and staphylococcal counts respectively. Dip slides do not provide interval data making it difficult to calculate the mean therefore, the results include the mode, percentage of sites classified as clean and the number of sites with values greater than 12cfu/cm². The latter are considered to indicate heavier levels of microbial contamination (26) and are provided to indicate the extent of contamination of some sites. Figure 5.1 is a pictorial representation of dip slide counts. At 100 cfu/cm² colonies are too numerous to count, and the surface of the dip slide shows confluent growth. The aerobic colony count is a general measure of surface bacterial contamination and high counts may not necessarily be significant from a food safety perspective as the bacteria may be harmless organisms, but nevertheless are a reflection of cleaning and disinfection. Enterobacterial counts indicate the presence of bacteria which could be of intestinal origin, and staphylococcal counts show organisms primarily of hand origin. Representatives of both of these groups can give rise to food poisoning.

Figure 1. Dip Slide Surfaces – Aerobic Colony Counts (ACC)



Aerobic colony counts, especially for RTE display and preparation surfaces indicate quite high levels of contamination with 46% and 61% of sites in excess of 12cfu/cm². In both cases maximum values were 100 cfu/cm² and these were obtained on 8% and 11% of occasions. On only 4% and 6% of times would the surfaces be considered “clean”. Hand contact sites were also considered quite heavily contaminated, especially the hot tap handle of the hand wash sink. Although only 4 were sampled, they were not classified as "clean", had counts in excess of 12cfu/cm² on 50% of occasions and had counts up to 100 cfu/cm². Till keys were also often contaminated, with only 13% of samples classified as clean.

Ideally, enterobacterial counts on either food or hand contact surfaces should be minimal. Three food contact surfaces for RTE (display surface, slicer blade and preparation surfaces) in total representing 97 samples, could cause concern. The three sites had, on occasions, levels up to 100cfu/cm² (6%, 2% and 4% of occasions) and were considered clean on 50%, 65% and 43% of occasions. Overall the sites contained counts in excess of 12 cfu/cm² on 23%, 12% and 22% of occasions. Tongs used to touch RTE were the cleanest of the food contact sites tested. All hand contact sites harboured higher than desirable levels of enterobacteria with counts up to 100 cfu/cm² found on the hot tap and chiller handle. Hand contact sites were less likely to be considered clean and were more likely to have counts in excess of 12 cfu/cm² than the food contact sites.

Staphylococcal counts, as might be expected, were higher on hand contact than food contact surfaces. The number of hand contact sites tested for Staphylococci was limited (11 only), but two categories (hot tap and chiller door handles) were always in excess of 12 cfu/cm² as were 75% of till keys. None of the hand contact sites would be considered “clean”.

Table 5.6 Enterobacterial counts of specific sites

Type of Surface	Mode cfu/cm ²	Range	Number of Sites Tested	% of Sites Classified as Clean	% Sites 12 or >12cfu
<u>Food Contact</u>					
Display Surface RTE	<2.5cfu	<2.5-100	31	50	23
Slicer Blade RTE	<2.5cfu	<2.5-100	43	65	12
Tongs for RTE	<2.5cfu	<2.5-2.5	14	57	0
Scale Pan RTE	<2.5cfu	<2.5-12	39	54	5
Preparation Surface RTE	<2.5cfu	<2.5-100	23	43	22
<u>Hand Contact</u>					
Hot Tap – Sink	2.5cfu	2.5-12	4	25	25
Hot Tap – Hand Wash Basin	<2.5cfu	<2.5-100	5	40	40
Chiller Door Handle	2.5cfu	<2.5-100	5	40	20
Till Keys	<2.5cfu	<2.5-12	19	58	11
Phone	<2.5cfu	<2.5-12	6	67	17

Table 5.7 Staphylococcal counts of specific sites

Type of Surface	Mode cfu/cm ²	Range	Number of Sites Tested	% of Sites Classified as Clean	% Sites 12 or >12cfu
<u>Food Contact</u>					
Display Surface RTE	<2.5cfu	<2.5-12	5	60	20
Slicer Blade RTE	2.5cfu	<2.5-40	16	6	44
Tongs for RTE	2.5cfu	<2.5-12	5	40	20
Scale Pan RTE	2.5cfu	<2.5-12	7	29	14
Preparation Surface RTE	2.5cfu	2.5	5	0	0
<u>Hand Contact</u>					
Hot Tap – Sink	2.5cfu	2.5-12	3	0	33
Hot Tap – Hand Wash Basin	12cfu	12	1	0	100
Chiller Door Handle	100cfu	100	1	0	100
Till Keys	2.5cfu	2.5-12	4	0	75
Phone	2.5cfu	2.5	2	0	0

5.2.2 Discussion

Processing, preparing and handling food, particularly raw meat, can easily give rise to contaminated surfaces, utensils and hands. This can be minimised by good handwashing, cleaning and working practices coupled with appropriate design, layout and construction of premises. However, cross contamination of ready to eat meals / food can occur in butchers' shops and has given rise to food poisoning in the past (8).

There have been a number of studies within the past 2 years looking at levels of contamination in food handling environments (23,27) although results are not always comparable due to differences in methodologies. Additionally, there are no universally agreed standards of bacterial surface contamination, although a general consensus is starting to emerge. An upper limit of 10 cfu/cm² has been suggested by the US Public Health Service, whilst the Swedish Food Standards Agency suggests a target of <1 cfu/cm² with an upper acceptable limit of 3 cfu/cm². Based upon cleaning results of over 2000 food surfaces, levels of <2.5 cfu/cm² are attainable and have been suggested as benchmark values (22, 32). This level has also been found to be appropriate after cleaning in smaller premises (28). The EU suggests cleaned and disinfected surfaces for meat slaughtering and cutting plants should be <10 cfu/cm² with enterobacterial counts of 0-1 cfu/cm² (29). Thus, whilst there are no universally agreed values, levels between 2-3 cfu/cm² for aerobic colony counts are generally considered appropriate with counts over 10 cfu/cm² generally considered unacceptable. Acceptable counts for indicator organisms such as coliforms / enterobacteria would be much lower.

Overall 63% of surface areas are visually clean which is similar to other studies of butchers shops (8) and for general food premises (35-80%) (27). Although it must be remembered visual assessment is a poor indicator of surface contamination.

The present study found around 24% of surfaces to be moist although this was higher for hand contact surfaces. This compares to 20-25% (22) and 28% (27) for hand contact surfaces in other studies of food premises. Moisture levels can impact on microbiological testing which is generally less sensitive on dry surfaces leading to an underestimate of the true microbial load (25). Cross contamination is also much easier if one of the surfaces is moist.

The overall ATP results are similar to those for other general food premises (22). However, mean values for 3 out of 4 comparable surfaces were lower in the present study than one carried out prior to the butchers developing their HACCP plans (8). This could be a reflection of the increased time butchers now claim to spend on cleaning.

As for the microbiological data, of particular concern are the often high levels of enterobacteria isolated, especially from hand contact surfaces. Hands frequently touch ready to eat foods during preparation and retailing and, once contaminated, can easily transfer organisms to food. The results are also higher than for food service premises and this may be a reflection of enterobacterial contamination levels on large quantities of raw meat entering the butchers. Other studies (10) have suggested that at least in one local authority, enterobacterial counts decreased after licensing. The reasons for this are unknown but could reflect improvements as a result of targeted advice or knowledge that sampling would take place and which sites would be tested. Also this latter study did not consider hand contact surfaces, although it did also obtain some surface counts in excess of 100 cfu/cm².

Staphylococci are part of normal skin flora and as such are more difficult to remove by handwashing. Nevertheless, some strains can cause food poisoning, and they are more tolerant to salt used in the preparation of cooked meats. Although far fewer samples were taken, the number of slicer blades (n=16) with *Staphylococcus aureus* counts in excess of 12 cfu/cm² is higher than desirable.

5.3 Key Findings and Implications

Findings	Implications
1. 24% of “in-use” surfaces were moist, especially hand contact surfaces. Visual assessment was more likely to indicate surfaces as clean than other methods.	Moist surfaces increase the potential for cross contamination and microbial transfer. Visual assessment is a poor indication of surface cleanliness.
2. ATP values on surfaces were variable but still too high including hand contact surfaces	Further improvements in cleaning practices needed Need to include hand contact sites in cleaning programmes
3. Some evidence that ATP surface values were lower overall than in a previous study of butchers’ shops	Could be some improvement in cleaning practices as a result of the initiative
4. Microbiological testing indicated quite high counts. Enterobacterial counts particularly were in excess of desirable levels	Further improvements in cleaning practices required. Ensure complete separation of raw from cooked areas including chillers and cleaning equipment. Frequency and timing of handwashing critical Need to ensure appropriate hygienic facilities for handwashing, ideally non-hand touch taps and dispensers.

6.0 Summary and Conclusions

The project has attempted to determine butchers' knowledge, attitudes understanding and practices relating to licensing and the requirement for a documented HACCP system. The quality of the HACCP systems in use was evaluated using a self assessment audit checklist and auditing butchers' premises coupled, where possible, with tests for surface cleanliness. In implementing the project approximately 4300 butchers (approximately 60% of English butchers) were contacted overall although this varied by region. Responses / acceptance rates varied from 16% for the questionnaires declining to 11% for the self audit and approximately 6.5% for the audit visits. A possible point for the FSA to note is that although butchers have largely come to terms with the licensing requirement, some of the negativity associated with it has been personalised to the FSA. Especially during the initial telephone recruitment of participants for the audit phase, one of the main reasons expressed by butchers for not participating was negativity directed towards the FSA. However, this is anecdotal and cannot be quantified. Some negativity to licensing has also come from retailing in general (31). Nevertheless, cumulatively approximately 6% of English butchers contributed in one way or another to the project and hence the data collected, making this the most comprehensive study so far undertaken of the licensing initiative.

Given that over 400 butchers contributed it is perhaps not surprising that a diversity of views and practices have been found. Certain generalised themes or trends do emerge.

The MLC initiative undoubtedly has had a considerable measure of success. The butchers themselves felt their knowledge of HACCP and food safety, and their ability to implement controls had improved significantly. They also felt they had more control over food safety. They generally liked the initiative and its component parts.

Nearly all English butchers now have documented HACCP plans and this has been accomplished within a relatively short time period (approximately 2 years). The butchers are the only small business segment of the food sector to have totally documented HACCP systems. However, there is perhaps an undercurrent that these have been produced to comply with legislation rather than based on feelings of need

or risk. This came both from the questionnaire responses and anecdotal discussion with the butchers during the audits. Furthermore, the questionnaires and discussions with the auditors and the audit results themselves suggest there are still gaps, sometimes fundamental, in the butchers' knowledge of HACCP and food safety.

The butchers seem, in spite of initial and in some cases ongoing resentment, to the licensing requirement to have accommodated both the additional costs and time required within their working practices and the majority felt the initiative worthwhile. They felt that overall EHOs approved of their plans, and to a certain extent, this must be an accurate reflection due to only a small number of licence refusals. However, based on results from the self audit and the actual audits (194 or approximately 2.7%) there is an indication of considerable variation amongst butchers' HACCP plans. Furthermore some elements seem to be better implemented than others, although it must be emphasised none posed an imminent risk to food safety.

For example, there may be concerns over premises design and construction layout, hazard identification and step diagrams, setting target values and implementing corrective actions. There is variability in temperature monitoring practices and their likely accuracy, although it is perhaps in the areas of cleaning and cross contamination that the greatest concerns are found. From all aspects of the evaluation, evidence suggests there remains a variable but sometimes considerable potential for cross contamination between raw and cooked foods. Practices designed to prevent this from happening can be further improved. Cleaning programmes can be improved and surfaces could often be better cleaned, with enterobacterial counts in particular, remaining a concern.

Table 6.1 contains a brief summary of recommendations relating to the report.

Table 6.1 Recommendations

1. The project has identified gaps in knowledge / practices relating to food safety management. Ways in which these can be remedied should be considered. This could be either as part of routine re-licensing or as a follow up to the initiative which could, for example involve “refresher training.
2. The variation in approved HACCP plans indicates variability in enforcement and licensing practices. This needs to become more standardised and ways in which this can be achieved should be explored
3. Greater emphasis needs to be given by the butchers themselves and by EHOs, to further reduce the potential for cross contamination and improve cleaning within butchers' shops

7.0 References

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8.0 Appendices

Appendix 1	Butchers Questionnaires – QA
Appendix 2	Butchers Questionnaire – QB
Appendix 3	Self Audit
Appendix 4	Audit Checklist
Appendix 5	Cleanliness Data Recording Forum