

**A QUANTITATIVE ASSESSMENT OF CONSUMERS' ATTITUDES
TOWARDS RAW MEAT DECONTAMINATION TREATMENTS**

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GfK NOP

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Executive Summary

Campylobacter is the biggest cause of foodborne disease in the UK, with the majority of human infections being linked to the handling and consumption of chicken, but public understanding of Campylobacter risk is low. Reducing Campylobacter risk is a key target for the FSA.

Slaughterhouse decontamination treatments (such as lactic acid, hot water or steam) could potentially have a significant effect in reducing the Campylobacter risk.

The FSA therefore commissioned GfK NOP and Research Works to conduct a scoping study followed by a consumer survey to investigate public understanding and awareness of Campylobacter, and attitudes towards potential slaughterhouse decontamination treatments for poultry and beef, focussing on lactic acid.

The scoping study consisted of a literature review plus two focus groups with consumers, while the consumer study consisted of over 2,000 interviews with a random probability sample of those who ever buy or cook meat, including boost samples for the devolved countries.

Four treatments were covered in the consumer survey: lactic acid, ozone, rapid surface chilling, and heat/steam.

The Literature review revealed that consumers are aware that raw meat products are a potential food poisoning risk, and understand that raw chicken and beef are the most prominent risks. They mainly understand that the risk is bacterial in nature, and to some extent understand the effects of bacterial contamination of raw meat products.

However, specific consumer awareness of Campylobacter is limited. There is known to be some public resistance to innovative decontamination treatments,

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partly due to a lack of awareness and understanding (which implies a lack of adequate information and advice), and partly due to the unfamiliarity of those processes. There is some evidence to suggest that the language and context of information on innovative food processes is important to further public acceptance.

The consumer survey began with questions about attitudes to food and food poisoning. The majority of respondents were aware that they had a high degree of control over their risk of food poisoning, with men, and older people, less likely to think this. Two in three thought they were unlikely to get food poisoning at home, and almost all realised that some foods were more likely to cause food poisoning than others.

Chicken was by far the most often cited food as being a particular risk: 60% mentioned it.

One in three respondents had had food poisoning at some time.

Respondents were then given a brief description of four possible forms of in-slaughterhouse treatment to reduce the *Campylobacter* risk. Initial reactions to the four treatments, with minimal explanations, were mixed, but there was little enthusiasm. Initial response to both lactic acid and ozone were strongly negative, while response to heat/steam was neutral, and to rapid surface chilling it was slightly positive

After the presentation of more information about lactic acid treatment a majority considered it acceptable. The fact that lactic acid is a natural substance had most impact on changing opinion, though the way the question was asked we cannot be sure whether respondents were reacting to this particular information or merely the provision of any additional information.

Extra information had less impact on support for rapid surface chilling, but ultimately two in three considered it acceptable. In this case it was the fact that treated meat could safely be frozen that had the most impact on support for the

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treatment, although with the same caveat as expressed in the previous paragraph.

The level of variation in response once extra information had been given to respondents suggests that the specific information presented to the public about *Campylobacter* treatments is likely to have a considerable impact on public opinion.

Asked directly whether they would support or oppose treatment, two in five would support lactic acid treatment for raw chicken and for raw beef, while one in three were opposed. An additional one in ten had earlier said that they found the idea of lactic acid treatment acceptable, but did not go so far as to support its use. Younger people, those with children under 4, and those from ethnic minorities were more in favour.

If offered a choice in a shop between chicken treated with lactic acid or untreated chicken respondents would split fairly evenly, with 38% buying treated and 44% untreated.

Before being asked specifically about labelling for meat that had been treated to reduce the *Campylobacter* risk, respondents were first asked more generally about how much they look at labels.

A third (33%) of respondents 'always' look at labels on raw meat products in the supermarket for information other than product, price and special offers. Those that ever look at labels are most likely to look at best before dates (67%) or country of origin (44%).

The majority (96%) felt it was important to label raw meat products that had been treated with lactic acid. When given four options for possible labelling of treated meat, most (41%) preferred the one with the most detail.

When asked about which products should be labelled, demand was highest for packs of chicken joints to be labelled – the only example where respondents would be buying food to cook themselves from raw.

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Respondents were not convinced by any of a series of reasons why meat treated with lactic acid might not need to be labelled, and labelling was seen as more important for the chemical treatments than for the physical ones.

Those who were less likely to consider the treatments acceptable were more likely to consider labelling important.

Respondents were asked if they agreed or disagreed with a number of statements about food and food hygiene and also about their cooking and shopping habits to gather data for use in multivariate analysis.

There was almost universal agreement that “what you eat makes a big difference to how healthy you are”, and only slightly less that “The experts contradict each other over what foods are good or bad for you”.

One in three agreed, but half disagreed, that “For me, most of the time food should be as quick as possible to prepare” and almost equal numbers agreed and disagreed that “When preparing food for myself I could be more careful about hygiene”.

Three in four said they did “most” of the cooking, and two in three “most” of the shopping. Three in four cooked chicken at least once a week, and three in five cooked beef weekly.

Three in four bought their meat from a supermarket and a third from a butcher’s.

In terms of meeting the survey objectives of establishing public reaction to decontamination treatments, the project revealed some clear negative views about chemical forms of treatment, with much more positive views about physical treatments. It also showed that, given sufficient information, most people became more positive about both forms of treatment.

The survey results were in line with the only two comparable studies, one in Denmark and one by Which? magazine in the UK.

Introduction

1 Introduction

The Food Standards Agency (FSA) has a strategic priority to reduce foodborne disease, with a particular emphasis on tackling *Campylobacter* in chicken. *Campylobacter* is the biggest cause of foodborne disease in the UK and recent research has suggested that between 35% and 80% of human *Campylobacteriosis* cases may be attributable to chicken sources¹. Key aims of the Agency's *Campylobacter* Risk Management Programme are to identify and implement practical and effective interventions to reduce *Campylobacter* in chicken and reinforce messages to consumers and caterers on safe preparation and cooking practices and avoiding cross-contamination.

Two areas where an understanding of consumers' attitudes would be valuable in assessing what interventions would be most cost-effective are the acceptability of slaughterhouse decontamination treatments for raw poultry and attitudes towards washing poultry, including messages designed to discourage this practice. In order to put this information into context and understand consumers' responses on these issues an assessment of understanding and awareness of *Campylobacter* would also be of value.

1.1 Raw meat decontamination treatments

Slaughterhouse decontamination treatments (such as lactic acid, hot water or steam) could potentially have a significant effect in reducing the *Campylobacter* burden on chicken meat thereby reducing the levels of *Campylobacter* to which consumers are exposed in the home. Some of these treatments are not currently permitted under EU legislation and it is argued that consumers would not accept their use. Research to assess consumers' attitudes towards the use of and labelling/descriptions of specific decontamination treatments would provide evidence to help inform the UK's

¹ "European Food Safety Authority, Scientific Opinion on Quantification of the risk posed by broiler meat to human *campylobacteriosis* in the EU. EFSA Journal 2010; 8(1):1437 [89 pp.]"

Introduction

position at EU discussions on currently unapproved poultry decontamination treatments and assist in understanding what information affects the acceptability of certain treatments. Around the time of commissioning this project a proposal to permit lactic acid treatment of beef was under discussion at the European Commission. The scope of this project, in relation to consumers' attitudes to decontamination treatments, was therefore widened to include beef as well as poultry and to focus on lactic acid as the main treatment of interest.

1.2 Labelling to discourage washing of poultry

Previous research conducted by the FSA has indicated a potential risk in the home from people washing raw meat/poultry and so potentially spreading bacteria onto work surfaces and ready-to-eat foods². The FSA is investigating ways of labelling raw poultry to indicate to consumers that they do not need to wash it before cooking to reduce the risk of cross-contamination. Information on whether consumers currently refer to the 'safety' information on-pack and the usefulness of providing additional messages around not washing chicken would help inform any initiatives aimed at discouraging washing of poultry.

1.3 Understanding and awareness of Campylobacter

Previous research undertaken by the FSA has shown awareness of Campylobacter to be low in comparison to other food poisoning bacteria³. It may be that awareness of the bacteria itself amongst the general public is not important in terms of communicating messages on prevention of foodborne illness (specifically on cooking and cross contamination). However measuring awareness and understanding of Campylobacter could provide important contextual information to understanding responses to both attitudes to decontamination processes and responses to communications about cross-contamination preventative measures.

² Microbiological risk factors associated with the domestic handling of meat, B02016, 2004, Campden and Chorleywood Food Research Association (CCFRA).

³ FSA Campylobacter Citizens' Forums, September 2010, TNS BRMB
<http://www.food.gov.uk/multimedia/pdfs/citforumcampy.pdf>

Introduction

1.4 Campylobacter citizens' forums

The FSA's Campylobacter citizens' forums³, held in 2010, gathered views from around 100 individuals to provide qualitative information on consumers' awareness of Campylobacter, their purchasing habits and the acceptability of interventions to control Campylobacter at farm, processing and retail level. While there was a good level of awareness among respondents of the potential health risks related to chicken if it wasn't stored, prepared and cooked properly, there was little awareness about Campylobacter and its effects. In relation to potential slaughterhouse decontamination treatments there was concern that processing interventions, including chlorine washes, lactic acid spray and freezing would affect the taste, smell and texture of the meat and respondents felt that these changes would be unpopular. Terms that suggested that 'chemicals' would be left on the food were also considered likely to cause concern. Overall forum respondents recognised that Campylobacter presented a significant public health risk and therefore they supported interventions designed to reduce the level of the bacteria on chicken sold to the public, which they felt would be reassuring to consumers. However, they felt it would be important to promote hygienic handling of chicken to ensure that the public do not become complacent about their responsibility to protect themselves.

1.5 Aims and objectives

Although the citizens' forums provided some qualitative information on attitudes towards decontamination practices and awareness of Campylobacter and food poisoning a more quantifiable assessment of consumers' views was desired specifically focussing on UK consumers':

- understanding and awareness of Campylobacter
- attitudes towards potential slaughterhouse decontamination treatments for poultry and beef, focussing on lactic acid
- attitudes towards potential labelling used to discourage washing of poultry

Introduction

The project was let by tender to a partnership of GfK NOP and Research Works. The research consisted of three stages:

- a scoping study to look at existing evidence via a literature review
 - The aim was to look at existing evidence on public attitudes, capture methodological insights and inform the other two survey stages
- qualitative work in the form of two focus groups to develop a questionnaire,
 - the aim was to understand consumer concerns and their areas of knowledge weakness, and to help frame the questionnaire by using language that was commonly understood
- and a quantitative study of the British public, using a face to face random probability survey
 - the aim was to collect views and demographic information from a representative sample of adults in the UK who ever buy or cook meat, to allow exploration of differences in opinion between different sub-groups of the population.

This report mainly contains the findings of the quantitative stage, with the qualitative work summarised in the main report and the scoping study report attached as an appendix.

Development Work

2 Development Work

2.1 Scoping Study

The full report of the literature review can be found at Appendix A. This section provides a brief summary of the scope of the review and the main findings.

2.1.1 Scope

The literature review investigated public awareness of, and acceptance of, decontamination practices and treatments, both in the home, and in the commercial environment.

The review comprised a survey of the available literature on the subject of consumer attitudes/understanding of food safety, food practices, production processes, and treatment options. It gathered existing information, pointed to gaps and limitations in the literature, and offered findings and recommendations for further research and actions in relation to *Campylobacter* and food safety. The study was principally a 'review of reviews' it was not intended to be a systematic review of the available literature; given the fragmented nature of the research available, and the time constraints of the project, this was felt to be the most fruitful approach. It was conducted following the criteria set out in a recent development study for the FSA (Smeaton et al, 2010)⁴, in terms of risks of conditioning; social desirability bias; measurement of low salience behaviours; telescoping; response bias; knowledge questions; and the effects of question location and order.

This review was based on analysis of thirty-three main documents relating to food safety in general, and *Campylobacter* in particular. Seven of those documents were themselves reviews of existing literature, referencing a further twenty-four studies of varying relevance. Of the remaining studies, the majority were qualitative research

⁴ Smeaton D, Draper A, Vowden K, Durante L (2010) Development Work for Wave 2 of the Food Issues Survey *Crown Copyright 2011*

Development Work

studies on specific aspects of food hygiene and safety, for publication in relevant journals; reviews of research undertaken for governmental and inter-governmental agencies; and industry-oriented journal articles.

2.1.2 Findings

Consumers are aware that raw meat products are a potential food poisoning risk, and understand that raw chicken and beef are the most prominent risks. They understand that the risk is bacterial in nature, and to some extent understand the effects of bacterial contamination of raw meat products. Specific awareness of *Campylobacter* (now the most common cause of food poisoning in the UK) is limited.

Domestic food safety practices are inconsistent; consumers self-report good practice, but observational studies suggest that the reality is occasionally less hygienic. As more of the population are seen as vulnerable to the effects of foodborne infection, there is a need for more and better guidance and information on good food practice in the home.

There is some public resistance to innovative decontamination treatments. This is partly due to a lack of awareness and understanding (which implies a lack of adequate information and advice), and partly due to the unfamiliarity of those processes. There is some evidence to suggest that the language and context of information on innovative food processes is important to further public acceptance.

It was noticeable that the literature review found very little existent evidence specifically on attitudes to decontamination treatments for meat, with only two studies being found: one conducted in Denmark in 2011, and a study by Which? that was ongoing at the time the literature review was carried out

2.2 Focus groups

The literature review was supplemented by two group discussions with consumers. A full report of the focus group findings, and a copy of the topic guide for the groups,

Development Work

can be found at Appendix B. A summary of the approach used and main findings are given below.

2.2.1 Methodology

Two focus group discussions were conducted, each of 1.5 hours duration with 8 respondents in St Albans on 13th February 2012.

The recruitment criteria for each group were as follows:

- Group 1 – all respondents were from ABC1 socio economic groups
- Group 2 – all respondents were from C2DE socio economic groups
- A mix of male and female was achieved in each group
- A mix of ages and lifestages (i.e. with and without children, living with or without partner) was achieved in both groups
- A mix of ethnic minority background was achieved in each group

These are fairly standard criteria for conducting groups intended to represent the whole population when as few as two groups are being conducted. All respondents ate meat regularly (at least once a week). Respondents for the groups were recruited by specialist recruiters from among the general public in the area.

2.2.2 Findings

Respondents in both groups were unaware of the different types of food poisoning, with Salmonella being the only type spontaneously mentioned. Only a small number of respondents had heard of Campylobacter. There was, however, a much higher awareness of the more general risk of food poisoning.

Food poisoning was attributed largely to undercooked food - and it was perceived as particularly important to cook chicken well. Respondents were also aware of the need for good food hygiene practice when handling chicken.

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Respondents were surprised that the incidence of Campylobacteriosis is so high and the number of deaths astonished them, particularly as they had not heard of the disease in the first place.

Initially, the idea of treating raw meat to reduce surface contamination caused concern. Respondents didn't feel it sounded very appetising. They were concerned that decontamination treatments might affect the taste of the chicken since they assumed that any treatment would involve adding chemicals to the meat.

The use of the word 'acid' was very emotive. It was perceived to infer that the process used chemicals or was very astringent. Once those aware that lactic acid is a natural substance produced by our bodies informed the rest of the group, all became more accepting of the possibility of the treatment. However, everyone still felt they needed to have more information about it.

Nearly all agreed that consumers would need to be informed about the treatment on the food label. This is a typical consumer reaction since labelling is perceived to be a central feature of the 'food safety information structure', as detailed in the literature review that forms part of the scoping stage of this project.

2.3 Questionnaire development

The original aims of the project included measuring awareness of Campylobacter.. However, when Campylobacter was raised in the focus groups there was very low awareness. Given the limited number of questions that could be asked within the agreed survey length it was decided that the quantitative survey should focus on asking about decontamination treatments and specific questions about Campylobacter awareness were therefore not included.

A first draft of the questionnaire was produced in the form of an outline, indicating the topics to be covered, rather than actual questions. This was based on the *a priori* objectives of the FSA, plus the themes that emerged from the literature review and the focus groups.

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At this stage the remit of the questionnaire was quite broad: it covered, for example whether people routinely washed chicken at home, and messages that might prevent them doing this. Due to limitations on the number of questions that could be covered in a 20 minutes survey and to make the survey more coherent it was subsequently decided that the questionnaire should focus more on the decontamination treatments themselves, and the other questions were dropped.

Following a series of iterations of the draft, and comments from FSA, Research Works and GfK NOP team members, a draft set of questions was agreed and tested.

These questions covered the following topics:

- Attitudes about food and food hygiene
- Frequency of cooking and shopping
- Experience of food poisoning
- Awareness of foods more likely to cause food poisoning
- Initial response to four types of decontamination treatment
- Response after hearing further information about treatment
- The importance of labelling food as having been treated
- Current usage of information on meat packaging labels
- Demographics, including occupation for coding to NS-SEC

2.3.1 Cognitive testing

The first stage of the questionnaire testing process was a series of cognitive interviews. These are interviews where, after having answered the questionnaire, respondents are quizzed in some detail about their understanding of the question wording, how they got to the answer they gave, and so on. The aim is to see if there are questions that the respondent answers without reporting any problems to the interviewer, but has clearly understood in a different way from that intended. Thirteen interviews in all were conducted, by Research Works and GfK NOP researchers. The Research Works interviews were conducted in their viewing facility and video recorded, while the GfK NOP ones were conducted in respondents' own homes and

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audio recorded. Specialist interviewers were responsible for the recruitment of participants for the cognitive testing, and all respondents were given a financial incentive to take part.

Because of the different levels of *Campylobacter* risk, the cognitive interview sample was biased towards mothers of young children and older people. The composition of the cognitive sample was as follows:

- 3 x mothers with children aged under 5 years old
- 2 x mothers with children aged 5-15 years old (1 also with a 3 year old)
- 1 x male aged 30-60 years old
- 1 x male aged over 60 years old and retired
- 1 x male aged 18-34 years old
- 2 x female aged over 60 and retired
- 2 x female aged 18-34 years old and working
- 1x male age 50-60 and working

Broadly speaking the interviews went well, with respondents reasonably engaged throughout, even though some found some of the concepts difficult to understand. One of the main changes made as a result of the cognitive interviews was actually made while they were going on, and that was the addition of a showcard containing the wording of the introduction about *Campylobacter*, so respondents could read it themselves at the same time the interviewer was reading it out.

Also, respondents in the cognitive interviews did not like being asked if they supported or opposed, as some said they didn't support it themselves but they had no worries about it being used. This question was therefore changed to ask instead about whether they thought treatment was acceptable or not.

A question trying to establish the extent to which people's opinion on lactic acid treatment would be influenced when they were told that the treatment is allowed within the EU proved to be one of the harder ones for respondents to answer, and was dropped after the cognitive interviews.

A question trying to establish the suitability of each of several possible wordings for labelling of treated meat was also problematic, and was changed to one asking simply which was most appropriate.

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Questions on whether people would tell friends if they were serving organic meat or if they were serving treated meat seemed odd to several respondents and were dropped.

After further discussions between the FSA, Research Works and GfK NOP a new version of the questionnaire was agreed and then scripted for more formal piloting using Computer Aided Personal Interviewing (CAPI).

2.3.2 Piloting

A more formal pilot study was then conducted to test the new wording of questions changed following the cognitive, and to give a final test, on a larger scale, of the whole questionnaire, to make sure it was suitable for use in a sample of over 2,000 interviews. Six interviewers worked on the pilot. They were briefed in a conference call on 29 May, and were debriefed by conference call on 1 June, after having conducted 52 interviews between them.

The interviewers reported that the interviews had mostly gone well; with respondents seeming to be paying attention to the information they were given and, for the most part, able to answer our questions.

There were a number of comments about things that respondents had found a little difficult, or had asked to be repeated, but in most cases the interviewers were able to recommend minor changes that would make things easier for respondents.

The questionnaire was still slightly over-length, and following a further round of discussions between the FSA and GfK NOP researchers some agree/disagree statements were dropped from the opening battery, along with a few other questions. Some wording changes were agreed, and a final version of the questionnaire produced for the main stage which can be found in Appendix D.

Survey Methodology

3 Survey Methodology

3.1 Sampling

The survey sample was a stratified random probability sample of private households in the UK, using the Postcode Address File (PAF) as a sampling frame. Census Lower Level Super Output Areas were the primary sampling units, and 100 were selected. The target achieved sample size was 2,000, chosen to yield robust results with low confidence intervals, and to allow detailed analysis by-groups. In order to allow some analysis by the four separate countries of the UK, the sample in Scotland, Wales and Northern Ireland was boosted with the aim of achieving 250 interviews in each.

It was decided that people who neither buy nor cook meat should be excluded from the survey, so in each household one adult aged 18+ (with no upper age limit) was selected for interview out of all adults who either buy or cook meat, using a Kish Grid random selection procedure in households where there was more than one eligible adult.

3.2 Fieldwork

In all 2110 interviews were conducted, with interviews carried out face-to-face in respondents' homes. This represents an overall response rate of 42%. However, because of communication problems between the interviewers' terminals and the central computer server, 32 interviews were lost and could not be replaced, and so the number of respondents in the final data was 2,078. Further details on the sampling and fieldwork are given in Appendix C.

The fieldwork for the survey took place between June and September 2012. In accordance with standard GfK procedures, 10% of interviews were subject to back-checking, and some interviewers were accompanied by Field management staff.

The following table shows the demographic breakdown of the achieved sample, and a comparison with the UK as whole.

Demographics of meat eating/cooking sample and total UK population			
	Sample n	Sample %	UK %
Age⁵			
18-34	466	22	29
35-54	717	35	35
55-64	339	16	15
65+	554	27	22
Gender			
Male	921	44	49
Female	1157	56	51
Children in Household			
Yes	627	30	30
No	1451	70	70
Country			
England	1440	69	84
Scotland	170	8	8
Wales	200	10	5
Northern Ireland	268	13	3

3.3 Analysis

A standard set of cross-analysis variables were agreed, including demographic, behavioural and attitudinal variables, and all questions were analysed by this standard set of variables. In addition to this cross-analysis, CHAID analysis was performed on some key variables. Further information is contained in Appendix C and E, and the full set of cross-analysis variables can be seen in the computer tables published on foodbase with this report <http://foodbase.org.uk/>

The Quantum computer tabulation software used for the tabulations contains built-in z-tests for standard errors, and highlights differences that are significant at the 95% confidence level.

The survey data were weighted, as is the case for all surveys of individuals using PAF as the sampling frame, to correct for the higher chance of selection of those

⁵ 2 respondents refused to give their age

Survey Methodology

living on their own. Weighting was also applied to restore the balance of the four constituent countries of the UK to their true proportions.

Most surveys also involve some form of weighting to correct for any of the imbalances that often occur, such as a greater tendency for women to be interviewed than men, and a tendency to under-represent young people. In this case such weighting could not be considered because of the decision to exclude those who never buy or cook meat. There are no reliable population estimates for this group, and so although the sample is indeed more female than the population at large, we have no basis for applying correction factors. There is little reliable information on the vegetarian population, but in any case our survey base would exclude more “traditional” men who ate meat but were entirely uninvolved in the purchase or cooking of it.

No corrective weighting was therefore applied, but it is worth noting that, as is discussed in detail in section 4.5.1 below, the statements that were used in both this survey and the Food and You survey⁶ produced almost identical results in the two surveys.

This implies that weighting is not essential, and also that the low response rate on this study does not seem to have harmed the quality of the data.

⁶ http://www.foodbase.org.uk/results.php?f_category_id=&f_report_id=641

4 Main Findings

Technical Note

This section covers the main findings of the quantitative survey, ordered thematically rather than in questionnaire order (the questionnaire is attached as Appendix D).

Differences between sub-groups are commented on only when they are statistically significant at the 95% level. It is worth commenting that, other than a lot of age difference and some gender differences, there was generally little difference in opinions between the sub groups. Except for a very small number of cases, which are outlined at the appropriate points in this report, there were no significant differences between the four home countries, despite the boost in sample size.

Some of the questions in this study appeared also in the FSA's "Food and You" survey, and for these questions – the attitudinal statements about food poisoning – comparisons are drawn in this report between the two studies, but it should be remembered that the "Food and You" survey did not exclude those who do not buy or cook meat.

In the summary tables presented with the report text figures may add to more or less than 100% because of rounding. Summary measures such as "all agree" and "net agree" are based on adding/subtracting the raw numbers, rather than percentages, and there may be apparent discrepancies in the summary tables as a result.

The full computer tables are available as a separate file.

4.1 Awareness of risk

Summary

- The majority of respondents were aware that they had a high degree of control over their risk of food poisoning
- Men, and older people, were less likely to think this
- Two in three thought they were unlikely to get food poisoning at home
- Almost all realised that some foods were more likely to cause food poisoning than others
- Chicken was by far the most often cited food as being a particular risk (60% mentioned it)
- One in three respondents had had food poisoning.

Respondents were presented with a series of attitude statements about risk, five of which were directly about food poisoning. These are discussed here, while the remaining statements are discussed in Section 4.5.1.

For each statement respondents were shown a card with five possible answers on it:

Definitely agree

Tend to agree

Neither agree nor disagree

Tend to disagree

Definitely disagree

Details of the percentages for each of these detailed answers to each statement (including the proportions saying “don’t know”, an option that was not offered on the show card) are shown in the computer tabulations attached to this report but in the interests of clarity the tables included in the body of this report show only four figures for each statement: a “total agree” figure, combining the two “agree” options; a similar “total disagree” figure; the percentage who answered “neither agree nor

disagree”; and finally a “net agree” figure calculated quite simply by subtracting the “total disagree” percentage from the “total agree” one.

Of the five statements three are demonstrably untrue and a fourth is almost certainly so, while the last is purely a value judgement. It is thus possible to use the untrue statements as a measure of knowledge of risk of food poisoning, and encouragingly a majority disagree with the three definitely untrue statements, suggesting they feel they have a high degree of control over their risk of food poisoning. Conversely, those who agree with these statements can be interpreted as having a low level of perception of their own ability to control their risk of food poisoning. It should be noted that this does not necessarily mean these people do have high or low degree of control of their risk of food poisoning, but their **perception** of this risk does appear to correlate with several of the questions in the survey, as is indicated in the report.

It should be acknowledged that there may be a degree of social desirability bias, whereby people who do not in fact disagree with the statements say that they disagree because they feel that is the “right thing to say”, but even if they do disagree for these reasons, the fact that they recognise what is the “right thing to say” is itself relevant and it was decided that it would be meaningful to use these statements to generate an analysis variable.

For the purposes of cross-analysis a variable was created to show perceived control of risk, by scoring each “definitely agree” answer with these statements as -2, each “agree” as -1, and so on up to +2 for each “definitely disagree”. Respondents could thus score anything from +6 to -6, and a three-way divide was generated, with those scoring from -1 to -6 classified as “low control of risk”, those scoring +4 or more “high control” and those scoring 0 to +3 as “medium control”.

As Table 1 shows, two in three are aware that it’s not just bad luck if you get food poisoning, and that you can still get food poisoning at home even if you never buy food that’s already bad. Around one in four thought each of those statements was true.

Awareness was lower for the statement “you only get food poisoning if you don’t cook food properly” – just over half disagreed with this, but 38% agreed with it.

It is extremely unlikely that all of our sample operate perfect food hygiene at home, so the statement “I am unlikely to get food poisoning from food prepared in my own home” is almost certainly untrue, and yet nearly two in three agreed while just under a third disagreed. But this may in fact reflect a wish by respondents to suggest to the interviewer that they kept a clean kitchen rather than any actual ignorance about food poisoning, and so it was not included in the control of risk variable.

The final statement, that “people worry too much about getting food poisoning”, cannot be said to be objectively true or false, so people’s agreement or disagreement with it reflects an opinion rather than knowledge, and it may be significant that this was the only one of the five statements about food poisoning on which respondents divided equally, with just 2% more agreeing than disagreeing.

Table 1 – Agreement with statements about food poisoning

Q1.1 Here are some statements people have made about food. Can you tell me to what extent you agree or disagree with them?

Base: All = 2,078

	All agree	Neither	All disagree	Net agree
It’s just bad luck if you get food poisoning*	26	10	63	-37
People only get food poisoning at home if they buy food that’s already bad*	23	6	70	-47
You only get food poisoning if you don’t cook food properly*	38	6	56	-18
I am unlikely to get food poisoning from food prepared in my own home	63	7	30	34
People worry too much about getting food poisoning	40	20	38	2

***Demonstrably untrue statements**

Looking at the perceived control of risk variable, men were, perhaps not surprisingly, less likely to feel they had a high degree of control: 49% of the low control group were men and 51% women, while for the high control group only 43% were men and 57% women. Looking at age, the low control group were much more likely to be over 75, while the high control group were much more likely to be middle-aged. Encouragingly, those in the high control group were more likely to have young children in the home.

Awareness is also very high that some foods are more likely to give you food poisoning than others. Only 7% thought this was untrue, while a further 3% were unsure. Almost everyone else could name at least one food that they thought was high risk, and most named several.

Table 2 shows all foods mentioned by more than 5%.

By far the most frequently cited high-risk food was chicken, mentioned by almost two in three respondents. Given that chicken is indeed a prime risk, this finding is encouraging, and is in line with the findings of the literature review, which showed that chicken was consistently seen as the most risky raw meat.

Indeed, all of the food types cited by 11% or more of respondents are indeed foods that are generally considered to have a higher than average risk of food poisoning, suggesting that some at least of the messaging on risk has got through. The gap between the proportion mentioning chicken and the proportion mentioning the second on the list (meat in general) is so great that it is clear that chicken is in a category of its own as far as perception of risk is concerned.

Table 2 – Foods more likely to cause food poisoning (only those cited by over 5% are shown)

Q2.2 You can get food poisoning if food is not stored, prepared or cooked properly. When you buy raw food to prepare and cook at home are some foods more likely to give you food poisoning than others? IF YES Which? Any others?

Base All = 2,078

Chicken	60
Meat in general	23
Fish in general	21
Pork/bacon/ham	19
Seafood/shellfish in general	19
Other dairy	14
Beef	11
Prawns/shrimps	11
Rice	8
Turkey	8
Mussels	7
Milk	7
Cheese	6
Vegetables and fruit	6

This knowledge is based on more than personal experience, for only a third were sure that they had ever actually had food poisoning themselves – 21% once and 15% more than once. A further 8% thought they might have done but couldn't be sure it actually was food poisoning.

The same question on food poisoning was asked in the Food and You survey, and the results were almost identical: on the Food and You survey 23% reported that they had food poisoning once, and 16% more than once, with 5% not sure.

Those over 65 (some 554 respondents in all) were the ones least likely to say they had had food poisoning. Given recent advances in food hygiene it is unlikely that this age group has actually had less experience of food poisoning than younger

respondents, but the question measures people's **reported** rather than actual behaviour, and there many reasons why reported behaviour may differ from actual.

Those who had had food poisoning were more likely to be in the group thinking they had a high control of their risk of food poisoning – 31% of the total sample were in the high perceived control group, while 39% of those who had had food poisoning were.

In terms of the perceived risk of contracting food poisoning, findings from the literature review suggest that consumers perceive the risk as (a) more prevalent externally (e.g. in restaurants and hotels) than in the home, and (b) less of a priority risk than longer-term risk issues, such as those stemming from food additives, pesticides and inorganic contaminants.

4.2 Reaction to treatment types

Summary

- **Initial reactions to the treatments, with minimal explanations, were mixed, but there was little enthusiasm**
- **Response to both lactic acid and ozone were strongly negative**
- **Response to heat/steam was neutral and to rapid chilling it was slightly positive**
- **After the presentation of more information about lactic acid treatment a majority considered it acceptable**
- **The fact that lactic acid is a natural substance had most impact on changing opinion, although whether this was due to the content of the information or just the fact that extra information was given at all could not be judged.**
- **Extra information had less impact on support for rapid chilling, but ultimately two in three considered it acceptable**
- **The fact that treated meat could safely be frozen had the most impact on support for rapid chilling**
- **The information presented to the public about Campylobacter treatments is likely to have a considerable impact on public opinion.**

4.2.1 Initial reactions

Respondents were given very brief descriptions of each of four possible treatments to reduce the risk of Campylobacter in meat, and were asked for an immediate reaction before the interviewer went on to give them further information about some of them. In a similar fashion to the earlier agree and disagree options for the statements about food, respondents were offered options from “definitely acceptable” to “definitely unacceptable”, and the report uses combined responses in exactly the way described in Section 3.1 above.

The four treatments (presented in random order) were:

- The meat is sprayed or misted with a weak solution of lactic acid
- The meat passes through a hot water bath or is exposed to steam in a chamber or tunnel
- The meat is exposed to ozone gas
- The surface of the meat is exposed to a rapid reduction in temperature for a short period

The cognitive stage and the pilot had revealed some confusion about the hot water/steam and rapid chilling options, with some people concerned that the meat would become cooked or frozen. Basic food safety knowledge was often misapplied by our respondents, and some thought that ANY temperature manipulation of raw meat would not be safe. Therefore, interviewers were primed to explain where necessary that only the surface of the meat was affected.

It is possible to characterise the treatments as either chemical – lactic acid and ozone – or physical – heating and chilling – and this typology seemed to resonate with respondents. As Table 3 shows, support was much higher for the physical ones than the chemical ones. There was clear net support for rapid chilling, with half thinking it acceptable and only a third unacceptable, while support and opposition for heat/steam treatment were effectively equal.

But for the two chemical options there was strong net opposition, with the negative reaction similar for each of them. Only 3% thought lactic acid treatment was “definitely acceptable”, and only 2% said this for ozone treatment. Even when this was combined with “acceptable”, the net figure was still under 16% in each case.

At the other end of the scale the very high unacceptable figures were almost identical for the two chemical treatments, with the total unacceptable score being 58% for lactic acid and 57% for ozone.

Table 3 – Initial reaction to treatment options

Q3.1 I am going to give you more detail shortly on these treatments, but first I'd like to get your immediate reaction to them, based on what I've just said about them. For each of these treatments, can you tell me how acceptable or unacceptable you think it would be to treat meat in this way to reduce the risk of food poisoning.

Base: All = 2,078

	All acceptable	No feelings either way	All unacceptable	Net acceptable
Rapid chilling	51	12	30	22
Heat or steam	41	12	40	1
Lactic acid	15	15	58	-43
Ozone	12	17	57	-44

As Table 4 shows, there were some fairly consistent patterns of response by gender and age, with all the treatments being seen as more acceptable by men than women, although the difference was less marked for heat/steam treatment.

The pattern was less consistent for age, though there were some clear differences. There were no real differences for ozone treatment, and there was no real pattern for rapid chilling, but the 18-24 year-olds viewed both heat/steam and lactic acid as considerably more acceptable than older respondents. For the latter it was mainly a case of 18-24 year-olds being different from everyone else, but for heat/steam there was a fairly consistent progression through the ages, with support getting steadily lower as respondents got older.

Table 4 – Net acceptable percentages for different gender and age groups

Q3.1 I am going to give you more detail shortly on these treatments, but first I'd like to get your immediate reaction to them, based on what I've just said about them. For each of these treatments, can you tell me how acceptable or unacceptable you think it would be to treat meat in this way to reduce the risk of food poisoning.

Base: All = 2,078

	Male	Female	18-24	25-34	35-44	45-54	55-64	65+
Rapid chilling	29	16	15	15	20	32	27	20
Heat or steam	6	-3	35	14	19	4	-18	-18
Lactic acid	-32	-51	-23	-42	-43	-40	-54	-44
Ozone	-32	-54	-37	-42	-42	-47	-51	-44

As Table 5 below shows, people who believed they had a high level of control over their risk of food poisoning had lower levels of support for the chemical treatments than those who perceived their control of risk as low, but a higher level of support for the physical treatments, especially for rapid chilling.

Table 5 – Net acceptable percentages by perceived control of risk

Q3.1 I am going to give you more detail shortly on these treatments, but first I'd like to get your immediate reaction to them, based on what I've just said about them. For each of these treatments, can you tell me how acceptable or unacceptable you think it would be to treat meat in this way to reduce the risk of food poisoning.

Base: All = 2,078

	High	Medium	Low
Rapid chilling	28	21	13
Heat or steam	3	1	-2
Lactic acid	-45	-45	-34
Ozone	-46	-45	-40

As has already been discussed, the treatments can be divided into chemical and physical treatments, and respondents generally had fairly consistent views on the chemical pair and the physical pair.

As Table 6 shows, only one in three respondents did not hold a consistent view across at least one pair. Only 4% supported all four treatments, while a further 13% opposed all four, with the majority making a distinction between the physical and chemical treatments. The biggest single group, almost half the total, was the 44% who opposed both the chemical treatments – far more than the 18% who opposed both the physical ones.

But the scale of opposition to the treatments can be seen by the fact that only one in four supported both the physical ones, even though half had found rapid chilling acceptable.

Table 6 – Physical and chemical treatments

Base: All = 2,078	
Support both chemical	6
Oppose both chemical	44
Support both physical	28
Oppose both physical	18
Support all four	4
Oppose all four	13
All other combinations	33

Looking at the interaction of the two treatment types shows that among the 28% that supported both the physical treatments, 40% opposed both the chemical treatments, and only 16% supported both of them. Conversely, among those who supported both chemical treatments the vast majority – 78% – also supported both physical ones, emphasising the generally greater acceptability of the latter.

These findings reflect the evidence from the literature reviewed in the scoping study, which suggests that there is considerable diversity in consumer attitudes to decontamination treatment. Issues such as process terminology, and the familiarity of a treatment process, impacted on their acceptability. There was some evidence to suggest that some of the treatment processes are not particularly well-recognised by consumers, and that media attention to processes, or ‘teachable moments’ (e.g. following an outbreak of food poisoning) could raise consumer awareness, and by extension, acceptance.

In relation to chicken and beef, UK levels of consumption are relatively high, and the scoping study revealed some evidence that high consumption rates correlate to higher acceptance rates for treatment processes. Diversity of risk perception also has an influence on awareness of treatment processes; consumers who see longer-term risk as more important may be less concerned with treatments that address food poisoning per se. Reassurance (familiar appearance, familiar food sources)

appears to have as great an influence on consumers as explanation of treatment processes.

4.2.2 Reaction to extra information about lactic acid treatment

Because lactic acid treatment was the main focus for the research, extra information was given about this (and one other) treatment to see if response to it varied once people were aware of more detail. In this way FSA might establish how consumers might respond to various pieces of information about lactic acid treatment.

Three additional pieces of information were given, and this time all respondents were presented with the three in the same order. In each case the format was the same: after giving the information the interviewer asked “now you know this, how acceptable or unacceptable do you think it would be to treat meat in this way to reduce the risk of food poisoning?”

It was decided that rather than randomise the order of presentation of the three pieces of additional information, they would be presented in the same order to all respondents. This means that in interpreting the relative power of each statement to change opinion, it may be that they would have been different had the statements been presented in a different order.

The first explained a little about what lactic acid actually is:

Lactic acid is a naturally occurring substance present in human and animal muscles. It is also present naturally in foods such as cheese, yogurt and soy sauce.

As Table 7 shows, this led to a marked increase in the acceptability of lactic acid treatment to our respondents from 15% overall at the original question to 49%. The proportion saying it was definitely acceptable rose from 3% to 8%, while the proportion saying it was acceptable increased even more dramatically from 12% to 41%. With just this one additional piece of information there were now more people finding lactic acid treatment acceptable than unacceptable.

There are two possible explanations for this statement having such an effect. The first draws on some of the findings of the scoping and piloting stages, and is that the word “acid” does not resonate well with consumers when thinking about food. This is

allied to the earlier discussion about chemical and physical treatments. The fact that lactic acid is a natural substance is clearly reassuring to a lot of people.

The alternative explanation is that ANY additional information would have a significant effect, and so whichever statement was presented first would have had the same dramatic effect.

The second additional piece of information concerned the practicalities of the process, and in particular the impact on the meat post-treatment:

The treatment involves spraying the raw meat surface with a fine mist of a solution of lactic acid. Only very small amounts are left on the surface of the meat after treatment, less than the amount that is present naturally in the meat before any treatment.

This had almost no further impact on the results: each of the two acceptable categories rose by 1%, and the net acceptable figure rose by 2%. Again' there are two possible explanations for this. The first is that it was the “unnaturalness” of lactic acid that was putting people off, and once that fear had been allayed, all those who were ever going to think lactic acid treatment was acceptable did so, leaving no other areas where improvement in the figures might happen.

The alternative explanation is the one discussed above, that respondents just needed SOME reassurance, and once that had been received from the information presented first, all subsequent statements – whatever they were – would have little or no additional impact.

Whichever explanation is correct, it proved true for the third extra parcel of information as well. This referred to the look and taste of treated meat:

Meat that has been treated with lactic acid in this way does not look or taste different from untreated meat.

This again had far less impact than the first additional information, but it did boost acceptability more than the information on residue. Total acceptability rose by a further 4% and net acceptability by 6%. Thus, as Table 7 shows an original net acceptability of -43% became +25% once respondents had been given all of the additional information.

The discussion above all concerns the **net** impact of giving people more information, but it makes sense to look in more detail at the changes as each extra piece of information was given. In theory the swing towards acceptability after the first extra information was given could have been the result of an even greater number of respondents who shifted towards more acceptable, offset by a smaller number who actually moved towards lower acceptance.

This seems implausible and the detailed figures show this rarely happened. Only 5% gave answers after the first extra information that were less favourable towards lactic acid treatment than their original answer, and the vast majority of these moved only one point along the scale from definitely acceptable to definitely unacceptable.

As one might expect from the net scores, just over half the sample became more positive after receiving the information about lactic acid being a natural substance. The biggest group (26%) moved only one point along the scale, but as many as 19% moved two points – the equivalent of “unacceptable” to “acceptable”, or from neutral to “definitely acceptable”. A non-trivial proportion – 8% - moved 3 points along the scale, and 1% even moved 4 points.

Women were generally more positively moved than men – 58% of women moved at least 1 point more positive, while only 47% of men did so – and those with children in the household made a slightly greater positive move than those without.

Given the scale of the absolute shift after the first extra information, it was not very likely that there was in fact an even greater move offset by a smaller one in the opposite direction, but with the net change being so small after the second additional piece of information was added there was more scope for a greater gross change.

And indeed this was the case, though it was still on a relatively low level: 78% of respondents gave exactly the same answer after the information about the level of residual lactic acid as they did before that information. This means that as many as 1 in 5 changed their answer, with the 13% who became more positive partially offset by the 9% who became more negative.

By the time the final extra information was presented even the gross level of change had dwindled, with 83% giving exactly the same answer as at the previous question.

Even here there was some self-offsetting change, with 12% becoming more positive and 5% more negative.

Table 7 – Reaction to lactic acid treatment after extra information given

Base: All = 2,078				
	All acceptable	No feelings either way	All unacceptable	Net acceptable
Initial information	15	15	58	-43
Lactic acid is natural	49	15	32	17
Little remains on meat	50	14	31	19
Look and taste unchanged	54	13	29	25

At the questionnaire design stage it was recognised that respondents were being presented with a lot of information, sometimes quite technical, on a subject that they knew very little about. Interviewers were therefore asked to record their own impressions of whether respondents were paying attention to all this information, or whether they appeared to have already made their mind up and answered without seeming to give any real thought to the extra information they were given. The decision to record interviewer impressions was based on experience of the cognitive interviews where some respondents appeared to lose focus towards the end of the questionnaire.

Fortunately, in the great majority of cases (80%) interviewers felt respondents were paying attention. There was a noticeable age divide; with the over-65s more likely to appear to be answering without paying real attention, as were those without young children in the household (these two groups of course overlap considerably). What is perhaps more important is that those who were opposed to rapid chilling treatment were much more likely to be seen by the interviewer as not paying attention.

Given that those who moved did so in favour of treatment this is not wholly surprising, but it does at least suggest that people weren't automatically giving a more favourable answer just because they were being told more.

Since respondents were being asked about something they had probably never heard of before, the questionnaire also asked them if there was any other information that would be useful to them in deciding whether lactic acid was acceptable or not. Two in three said they did not want any more information, while a further 13% said they would like more information but couldn't think of anything in particular, which left one in five who could think of extra information they would like. Their answers covered a huge range of information types, but possible side effects and allergy impacts, the scientific evidence, and the source of the lactic acid were among the most frequently mentioned.

4.2.3 Reaction to extra information about rapid chilling treatment

In the same way that extra information was given about lactic acid treatment, to see what factors might affect public acceptance, two extra pieces of information were given to respondents about the rapid chill treatments.

The first addressed the concern about whether the meat being treated actually froze as a result, which had been expressed by several people in the scoping and piloting stage, mostly by people who knew you weren't supposed to refreeze meat that had been frozen once and then thawed. Respondents thought that the bacteria would start multiplying again when the meat was bought back up to temperature. They were concerned that if they bought raw chicken that had been treated in this way they would be unable (or at least ill-advised) to freeze it at home. Interviewers therefore told people:

This treatment involves exposing the surface of the meat to a rapid reduction in temperature during the chilling process for a very short period. This treatment is most likely to be used on chicken. The surface of the skin may freeze momentarily but the flesh is not frozen.

Despite the concern expressed in the development stage about this very issue, providing this information made almost no difference to the answers, as Table 8 shows.

Main Findings



There was, however, a dramatic change in opinion when the second piece of information was presented:

The rapid chilling process kills some of the bacteria that cause the majority of food poisoning in the UK, these bacteria would not come alive again when the temperature was raised. Meat treated in this way can safely be frozen and defrosted without the bacteria coming alive again.

Once they were told this, respondents became far better disposed to rapid chilling treatment, with the net acceptable figure more than doubling from the original +22 to +52, and only one in six still thinking it unacceptable.

If rapid chilling treatment is to be used, it is thus very clear what information would provide most reassurance to consumers.

Table 8 – Reaction to rapid chilling treatment after extra information given

Base: All = 2,078				
	All acceptable	No feelings either way	All unacceptable	Net acceptable
Initial information	51	12	30	22
Meat not frozen	52	14	28	24
Can safely freeze	69	10	17	52

Comparing Table 8 above with Table 7 about lactic acid shows how very different the impact was for extra information on the two treatments – for lactic acid there was a total shift of 68 percentage points in net acceptability from the initial information to the final question, whereas for rapid chilling it was only 30 percentage points. This can't simply be explained by the fact that there was more extra information presented for lactic acid, and shows that the information presented to the public about Campylobacter treatments is likely to have a considerable impact on public opinion.

4.3 Consumer implications

Summary

- **Two in five would support lactic acid treatment for raw chicken and for raw beef, while one in three were opposed**
- **An additional one in ten had earlier said that they found the idea of treatment acceptable, but did not go so far as to support its use**
- **Younger people, those with children under 4, and those from ethnic minorities were more in favour**
- **If offered a choice between treated chicken or untreated chicken respondents would split fairly evenly, with 38% buying treated and 44% untreated.**

Having earlier introduced the idea of some meats being inherently more of a food poisoning risk than others, the questionnaire then investigated the extent to which the acceptability of lactic acid treatment varied between its application to chicken and beef.

It should be borne in mind that this question was asked after all the extra information had been given about lactic acid treatment, by which time just over half (54%) had said that they found the treatment acceptable, and only 10% found it definitely unacceptable.

Interestingly, as Table 9 shows, the proportion supporting the use of lactic acid treatment on chicken – 44% – was significantly lower than the 54% who had earlier said it was acceptable (the 54% are those who said it was acceptable after hearing all the extra information). Unless respondents were giving directly contradictory responses, the “missing” 10% must have been in the 19% who said they neither

supported nor opposed its use on chicken – they considered it acceptable, but they wouldn't actively support it.

This sense of some disconnect between the two questions is strengthened by the fact that of those who said lactic acid treatment was acceptable at the very first question about it, before the extra information was given, 7% said they opposed its use on raw chicken.

Given that, as was shown in Table 2, chicken is recognised as a much greater food poisoning risk than beef, it is somewhat surprising that there is very little difference between the two meats as far as acceptability of treatment is concerned: 44% support its use on chicken and 40% its use on beef.

Table 9 – Support for lactic acid treatment on chicken and beef

Q3.7 How strongly would you support or oppose the use of lactic acid treatment on raw chicken/raw beef?		
Base: All = 2,078		
	Chicken	Beef
Strongly support	9	7
Support	34	33
Neither support nor oppose	19	22
Oppose	18	18
Strongly oppose	14	14
It depends/don't know	5	5

Younger respondents were more in favour, especially so in the case of chicken where 21% of the 18-24s strongly supported the use of lactic acid treatment. Those with children under 4 were also more likely to support treatment, as were Black and Asian respondents though in the latter case the very small sample sizes in mind means caution is needed.

In one of the very few cross-national differences seen, respondents in Scotland were more likely to support treatment, while those in Northern Ireland were much less likely to support it strongly.

Table 10 – Support for lactic acid treatment on chicken by country

Base: All = 2,078				
	England	Scotland	Wales	N Ireland
Strongly support	8	5	6	2
Support	32	43	31	39
Neither support nor oppose	23	16	20	21
Oppose	18	16	22	16
Strongly oppose	14	16	14	14
It depends/don't know	4	5	6	8

Finally, the survey measured reaction to treatment in a more direct way, by asking respondents what they would do if faced by a choice in the supermarket between untreated chicken and chicken that had been treated with lactic acid. The results show that people do not need to support the treatment strongly to choose to buy treated chicken, with 38% saying they would buy treated – not far short of the 44% who supported treatment at all – and only slightly more, 45% saying they would buy untreated meat, with 17% unsure.

As one might expect given the attitudinal differences, the young were the most likely to buy treated – 50% would do so – as were those living in Scotland (47%).

4.4 Labelling

Summary

- A third (33%) of respondents 'always' look at labels on raw meat products in the supermarket for information other than product, price and special offers
- Those that ever look at labels are most likely to look at best before dates (67%) or country of origin (44%)
- The majority (96%) felt it was important to label raw meat products that had been treated with lactic acid
- When asked about level of detail most (41%) preferred the most detailed labelling option
- When asked about which products should be labelled, demand was highest to label the only example where respondents would be buying food to cook themselves (96% v 85% or below for other products)
- Respondents were not convinced by any of a series of reasons why treated meat might not need to be labelled
- Labelling was seen as more important for the chemical treatments than for the physical ones
- Those who saw the treatments as less acceptable were more likely to consider labelling important.

4.4.1 Current use of labels

Respondents were asked how often they looked at labels on raw meat products in the supermarket for information other than what the product is, the price and any special offers. Answers were coded to one of five responses:

Always

Usually

Sometimes

Or never

Not applicable/no labels

The 'not applicable' response was not openly given as an option, but interviewers were asked to use this code in cases where respondents said they usually bought meat from a butcher or a supermarket butcher's counter and so there were no such labels. This code was also used in cases where the respondent did not do the food shopping in their household and so could not provide a response to fit the main answer codes.

A third (33%) said that they always looked at other labels when buying raw meat in the supermarket. Females were more likely than males to do so (34% v 30%), and people from Asian ethnic backgrounds were much more likely to do so (55%), some of whom are presumably checking that the meat is Halal.

In addition to this third, 17% said they usually check other labels, 22% sometimes and 22% never. Just 6% fell into the not applicable/no labels response. Those who said they ever looked at other labels on raw meat products were then asked what sorts of things they usually looked for on the labels. This was an unprompted question with respondents left to answer in their own words.

The most frequently mentioned things included best before/use by dates⁷ (65%); where the product comes from (44%); and ingredients (28%). Once again this is

⁷ The questionnaire code is just "best before" but it is logical to assume that if respondents mentioned "use by" dates, the interviewer would have coded them to the same code.

similar to the Food and You survey where 75% said they look at “use by” dates when buying meat.

Table 11 – Information looked at on labels

Q4.2 What sorts of things are you usually looking for on the labels? Any others?	
Base: All who ever look at labels = 1,503	
Best before/use by dates	67
Where it's come from	44
Ingredients	28
To see if it's free range / barn	24
Nutritional value	21
To see if it's organic	18
To see if it's whole meat / recovered meat	12
Any other reason	25

4.4.2 How people would like treated meat labelled

Focusing respondents back on the lactic acid treatment that had been discussed earlier, respondents were asked how important or unimportant they thought it was that any raw meat treated with lactic acid to reduce the risk of food poisoning was labelled accordingly. Respondents were asked to answer on a four point scale:

Very important

Fairly important

Not very important

Not at all important

The vast majority (96%) felt that it was important to label any raw meat that had been treated with lactic acid to reduce the risk of food poisoning. Underlining the strength of feeling, 78% felt it was “very important”. Just 4% felt it was unimportant, including a mere 1% who felt it was not at all important.

This was a higher level of support for labelling than was reported in the Which? study, where 82% agreed that chicken that had had decontamination treatment

should be labelled, with just 1% disagreeing. Those who felt lactic acid treatment was unacceptable were significantly more likely to feel that it was important to label products that had been treated in this way. Women, and those aged 45-64 were more likely to say it was “very important” for treated meat to be labelled.

Not surprisingly, those who never look at labels when buying raw meat were less likely to say it was important that meat treated with lactic acid was labelled as such.

Respondents were then presented with three statements giving reasons why some people think it isn't necessary to label raw meat to show it has been treated with lactic acid:

- “There is no need for labelling because the treatment is of no safety concern”
- “There is no need for labelling because there is already lactic acid in meat and you can't differentiate between lactic acid added in the treatment and the lactic acid that is already naturally present in the meat”
- “There is no need for labelling because there is no legal requirement to have labels for lactic acid treatment, for example because it doesn't cause allergic reactions in people”

After hearing each statement they were asked to say how convincing or unconvincing they found it against the following scale:

Very convincing

Fairly convincing

Not very convincing

Not at all convincing

Not sure

The majority of respondents were not convinced (either very or at all) by any of the statements, which is not wholly surprising given the strength of feeling about the importance of labelling. The first and third statements (on safety and law) each had 79% saying they were not convinced (35% and 37% not very convinced and 44% and 42% not at all respectively), whilst the second had 73% (36% not very and 37% not at all).

Table 12 – Reasons why it isn't necessary to label raw meat to show it has been treated with lactic acid

Q4.4a/b/c There are a number of reasons why some people think it isn't necessary to label raw meat to show it has been treated with lactic acid. After hearing each on can you say from this card how convincing or unconvincing you think it is.

Base: All = 2,078

	Very convincing	Fairly convincing	Not very convincing	Not at all convincing	Not sure
There is no need for labelling because...					
...the treatment is of no safety concern	4	13	35	44	4
...there is already lactic acid in meat	5	16	36	37	7
...there is no legal requirement to have labels	4	11	37	42	6

Those with children aged 5 to 15 in the household were less likely to be convinced by the argument about there being no safety concern (49% of this group were not at all convinced, compared with only 39% of those with children 0 to 4). Those who found lactic acid and rapid chilling treatments unacceptable were also more likely to say they were not at all convinced than those who considered them acceptable (50% v 33% and 52% v 40% respectively).

Those who found lactic acid and rapid chilling treatments unacceptable were also more likely to say that the statement about lactic acid being already present was not convincing at all (43% v 22% and 43% v 31% respectively).

Those more likely to say they were not at all convinced by the statement about labelling not being a legal requirement included those aged 35 to 64 (49% v 33% to 36% in other age groups), those with children aged 5 to 15 in the household (46% v 38% with children aged 0 to 4) and those who found lactic acid treatment unacceptable (48% v 29% of those who found it acceptable). In addition, those who found the concept of lactic acid treatment acceptable were more likely to find all

three statements very convincing (8% v 3%, 13% v 3% and 8% v 3% in statement order).

Moving on to look at the details of labelling, respondents were presented with a list of four possible ways of labelling packs of raw meat and asked to state which they thought was best in terms of containing about the right amount of information. The possible options were that the label read:

- a) "This meat has been treated to reduce the risk of food poisoning"
- b) "This meat has been sprayed with lactic acid to reduce the risk of food poisoning"
- c) "This meat has been treated with lactic acid to reduce the risk of food poisoning. The taste and texture of the meat are not affected"
- d) "This meat has been treated with lactic acid to reduce the risk of food poisoning. The taste and texture of the meat are not affected, and there is no more lactic acid present than occurs naturally in meat"

The fourth (and most detailed) option was the most popular, chosen as best by 41% of respondents. Females (44% v 39% males) were more likely to favour this option, while those aged 18-24 were less likely to do so than those 25 or over (31% v 40% to 45%). The youngest group was also much more likely than any other group to choose the third option (37% v 21% to 27%).

Table 13 - Choice of wording for warning label on treated meat, by age and sex

4.5 SHOWCARD M On this card are four possible ways that packs of raw meat could be labelled to show that it had been treated with lactic acid. Can you say which of them you think is best, in terms of containing about the right amount of information?

Base: All = 2078

	Total	Male	Female	18-24	25-34	35-44	45-54	55-64	65+
“this meat has been treated to reduce the risk of food poisoning”	12	13	11	12	14	7	13	11	14
“this meat has been sprayed with lactic acid to reduce the risk of food poisoning”	15	16	14	18	18	20	15	13	1
“this meat has been treated with lactic acid to reduce the risk of food poisoning. The taste and texture of the meat are not affected”	25	26	25	37	21	24	26	27	25
“this meat has been treated with lactic acid to reduce the risk of food poisoning. The taste and texture of the meat are not affected, and there is no more lactic acid present than occurs naturally in meat”	41	39	44	31	44	45	42	40	41
None of these/ don't know	6	5	6	3	4	4	3	8	10

There is clearly a demand for detail, since the popularity of the other statements was ranked by level of detail with 25% overall choosing option c, 15% option b and 12% option a. Only 3% said 'none of these' and a further 3% 'don't know'.

4.4.3 Which outlets should label treated meat

Respondents were then asked which types of products they think should be labelled if labelling was introduced to show that meat had been treated with lactic acid. The question stated that labels might be on the food itself, or displayed in a café or restaurant. Respondents were presented with a list of different food types and asked whether or not they thought each should be labelled in this context. The food types they were asked about were:

- Packs of chicken joints
- Chicken nuggets
- Rotisserie roasted whole chickens
- Pizzas that contained chicken
- Beef in a burger from a fast food outlet
- Chicken salad in a salad bar

For each product the great majority of respondents answered that they should be labelled to show that the meat had been treated with lactic acid, with almost everyone saying that packs of chicken joints should be labelled. Table 14 shows the breakdown of responses.

Table 14 – Whether products should be labelled to show the meat has been treated

Q4.6 If labelling was introduced to show that meat had been treated with lactic acid, which of these types of product do you think should be labelled? The labels might be on the food itself, or displayed in the café or restaurant.

Base: All = 2,078

	Yes	No	Don't know
Packs of chicken joints	96	2	2
Rotisserie roasted whole chicken	85	12	3
Chicken salad in a salad bar	83	13	5
Beef in a burger from a fast food outlet	78	17	5
Chicken nuggets	78	15	7
Pizzas that contained chicken	72	21	7

It is worth noting that the item that had by far the highest proportion wanting labelling was the only one that involved raw meat unprepared in any way.

4.4.4 Attitudes towards labelling of different treatments

As discussed in Section 4.2.1 above, respondents were also asked about three other forms of treatment, and given more detailed information about rapid chilling treatment.

After being asked about labelling meat treated with lactic acid, respondents were then reminded of the other possible treatments and for each they were asked to state whether or not they thought meat treated in that way should be labelled.

In line with the different levels of acceptability of the two chemical treatments and the two physical ones, far more people felt ozone-treated meat should definitely be

labelled (73%) than meat treated with rapid chilling or steam/hot water (60% and 57% respectively).

Table 15 – Whether products should be labelled to show the meat has been treated

Q4.6 I mentioned earlier some other possible treatments to reduce the risk of food poisoning from meat. As I read each one out again, can you say if you think meat treated in this way should be labelled or not.

Base: All = 2,078

	ozone	rapid chilling	heat/ steam
definitely labelled	73	60	57
probably labelled	17	22	21
probably not labelled	2	11	12
definitely not labelled	2	5	6
not sure	6	3	4

As discussed above, those who found lactic acid treatment unacceptable were more likely to say that it was important for meat treated in this way to be labelled (97% v 93% of those who found lactic acid treatment acceptable). The same can be said, to some extent, for rapid chilling treatment. Those who found rapid chilling treatment unacceptable were more likely to say meat treated in this way should definitely be labelled (64% v 53% of those who found the treatment acceptable). However, those who found rapid chilling treatment acceptable were more likely than those who did not to say that it should probably be labelled (24% v 18%). Looking at an overall response, those who found rapid chilling unacceptable were more likely to say that meat treated in this way “should be labelled” (either definitely or probably) (81% v 77% of those who found it acceptable). In summary, those who find the treatments unacceptable to any extent felt a greater need for treated meat to be labelled accordingly.

4.5 Respondents' Food attitudes and behaviours

Summary

- **There is almost universal agreement that “what you eat makes a big difference to how healthy you are”, and only slightly less that “The experts contradict each other over what foods are good or bad for you”**
- **One in three agreed, but half disagreed, that “For me, most of the time food should be as quick as possible to prepare” and almost equal numbers agreed and disagreed that “When preparing food for myself I could be more careful about hygiene”**
- **Three in four said they did “most” of the cooking, and two in three “most” of the shopping**
- **Three in four cook chicken at least once a week, and three in five cook beef weekly**
- **Three in four buy their meat from a supermarket and a third from a butcher’s**

4.5.1 Food attitudes

As well as the statements about food poisoning already discussed in Section 4.1, there were four other statements that respondents were asked to agree or disagree with. One, on food and health, had almost universal agreement, with 95% agreeing that “What you eat makes a big difference to how healthy you are”, and only 2% disagreeing.

There was not quite such unanimity that “The experts contradict each other over what foods are good or bad for you”, but there was still a very clear majority agreeing – 78% agreed and only 10% disagreed. Agreement with the first statement was so overwhelming there was virtually no scope for demographic differences, but there were some with this second statement. Older people (all groups aged 45 and older) were more likely to agree, as were those who shop and cook a lot. Those who think labelling of treated meat is “very important” were far more likely to agree with this statement than other respondents (79% v 62%).

Main Findings



It is likely that some people would be reluctant to admit to less than perfect standards of hygiene, so it is perhaps encouraging that almost as many agreed that “When preparing food for myself I could be more careful about hygiene” as disagreed (44% and 48% respectively). Men were far more likely to agree than women (52% v 37%), as were the young. There was a clear age progression, with each age group less likely to agree than the one below. At the extremes, 65% of 18-24 year-olds agreed and only 35% of those aged 65+. There was no significant difference between those with and without children, and those with children under 4 were actually the most likely to agree.

Disagreement was slightly higher with the statement “For me, most of the time food should be as quick as possible to prepare”, with 35% agreeing and 50% disagreeing. Women were more likely to agree (38% v 32%), which presumably reflects the fact that they do more cooking, and the over-65s were also more likely to agree than all the other age groups (45% v 32%). Those with no children in the household were most likely to agree that food should be quick to prepare.

Table 16 – Agreement with statements about food

Q1.1 Here are some statements people have made about food. Can you tell me to what extent you agree or disagree with them?

Base: All = 2,078

	All agree	Neither	All disagree	Net agree
What you eat makes a big difference to how healthy you are	95	2	2	92
The experts contradict each other over what foods are good or bad for you	78	11	10	68
When preparing food for myself I could be more careful about hygiene	44	8	48	-5
For me, most of the time food should be as quick as possible to prepare	35	15	50	-14

Main Findings



Some of these statements were selected from the FSA's Food and You survey, allowing us to make comparisons between the two. The two samples are not entirely comparable, since the Food and You survey did not exclude those who never cook or buy meat, but it is striking how very similar the results are from the two surveys. Table 17 shows the statements that are in both surveys, with the Campylobacter study results alongside the statement wording and the Food and You results in the shaded row below.

The remarkable similarity of the results suggests that the lower than hoped for response rate on the Campylobacter study has not damaged the quality of the sample.

Table 17 – Attitudes to food in the Food and You and Campylobacter studies

Q1.1 Here are some statements people have made about food. Can you tell me to what extent you agree or disagree with them?

Base: All = 3,136 and 2,078

	All agree	Neither	All disagree
What you eat makes a big difference to how healthy you are	95	2	2
	91	4	4
The experts contradict each other over what foods are good or bad for you	78	11	10
	73	12	15
For me, most of the time food should be as quick as possible to prepare	35	15	50
	37	17	46

4.5.2 Meat buying and cooking

Almost two thirds of our respondents said that they do most or all of the cooking in their household. Even allowing for the degree of over-claiming that one would expect for a question like this, this suggests that there was a degree of self-selection on the doorstep, with those who do more cooking more likely to agree to take part in the survey, perhaps because it seemed more relevant to them.

Only 8% said they did no cooking at all, with men particularly likely to say this (15%).

The answers were very similar when respondents were asked if they did most, some, or none of the food shopping, with 65% saying “most or all”, 27% “some” and 8% “none”, with the youngest by far the most likely to do none at all (25%).

Three in four of our respondents cook chicken at least once a week (76%), and 87% cook it at least once a fortnight. Only 3% never cook chicken (and it should be remembered that those who never buy or cook meat at all are excluded from the survey).

Chicken is far more popular with the young, with 24% of 18-34 year-olds cooking chicken “most days” and a further 61% once a week. Among the over 65s, only 7% cook chicken most days.

Those with children in the household cook far more chicken than those without: less than 1% never cook chicken, 24% cook it most days and a massive 88% at least once a week.

Beef is cooked less often, with 58% cooking it once a week or more (compared with the 76% for chicken) and 7% never cooking beef.

To get an idea of our respondents’ meat-buying behaviour, they were asked if they normally bought their meat from a butcher’s, a supermarket, a market or somewhere else. Respondents were allowed to give more than one answer, and the vast majority said they bought from a supermarket (78%), far higher than the 32% who bought from a butcher’s, while a mere 4% normally buy from a market.

18-24 year-olds were more likely to buy from a supermarket (91%). Those in Northern Ireland were far more likely to buy from a butcher’s (50%).

Main Findings



One third of supermarket shoppers buy from Tesco (33%), with Sainsbury's second most popular on 18%, Asda on 17% and Morrison's on 15%.

4.6 CHAID Analysis

Summary

- **The CHAID analysis showed no common patterns, which mirrors the general lack of differentiation between the different demographic sub-groups**
- **While the detail varied from question to question, the one consistent theme was use of information on labels**

In an attempt to probe a little deeper into what best explains why some people are in favour of a treatment and others are not, a CHAID analysis was conducted, looking specifically at acceptability of the lactic acid treatment before and after the additional information; rapid chilling treatment; and choice of buying treated or untreated chicken. CHAID, which stands for CHi-squared Automatic Interaction Detection, is a type of decision tree technique, based upon adjusted significance testing.

A fuller description is given in Appendix E about how CHAID works, but it can summarised as a way of finding which variables best explain the difference between those who think or do something, and those who don't. It is a hierarchical system, finding first the variable that best explains the difference, **then the next most important after that first variable has been taken into account**, and so on. This means that variables identified at the second and subsequent stages only have meaning within their own branch of the CHAID tree, not among the sample as a whole.

It should be noted that this does not necessarily imply a causal relationship between the two; merely that the differences on the dependent variable are greater among this independent variable than among all the other independent variables. Also, the nature of CHAID analysis in general, and the lack of consistent patterns in this particular CHAID analysis, means that whereas one might reasonably suppose that any demographic differences commented on in this report might be found again in another survey on the same topic, the same is unlikely to be true of the CHAID.

4.6.1 Initial response to lactic acid treatment

Figure 1 below shows how this works in the case of lactic acid treatment. At this initial question about treatment, the dependent variable being whether people found lactic acid treatment acceptable, the first level discriminating variable was whether they agreed or disagreed with the statement “when preparing food for myself, I could be more careful about hygiene”. Those who agreed with this statement were considerably more likely to find lactic acid treatment acceptable than those who disagreed with it, or who had no opinion (17% compared with 13%).

It is fairly simple to find a theory as to why this may be the case – if people are aware that their own hygiene behaviour is not optimal, then they are more likely to approve of meat that has already been treated to minimise their risk of food poisoning.

Among those who agreed with this statement, the next biggest explanatory variable in terms of lactic acid treatment being seen as acceptable or not was effectively a dead end – it was a difference between those who did and did not name beef as one of the foods with a higher risk of food poisoning. Since it is hard to find any coherent theory to explain this, this has to be marked down as one of the “random” splits that CHAID can produce.

Returning to the first division point and following the other branch (those who disagreed or had no opinion about their own hygiene behaviour being less than perfect) the next most important explanatory variable for support of lactic acid treatment in this group is whether or not people look at best before dates on labels, with those who do look being more likely to find lactic acid treatment acceptable (16% v 10%).

There is no immediately obvious connection between lactic acid treatment and best before dates, but this is only one of several CHAID trees where looking for **something** on the label is an explanatory variable, and the actual information sought varies almost every time.

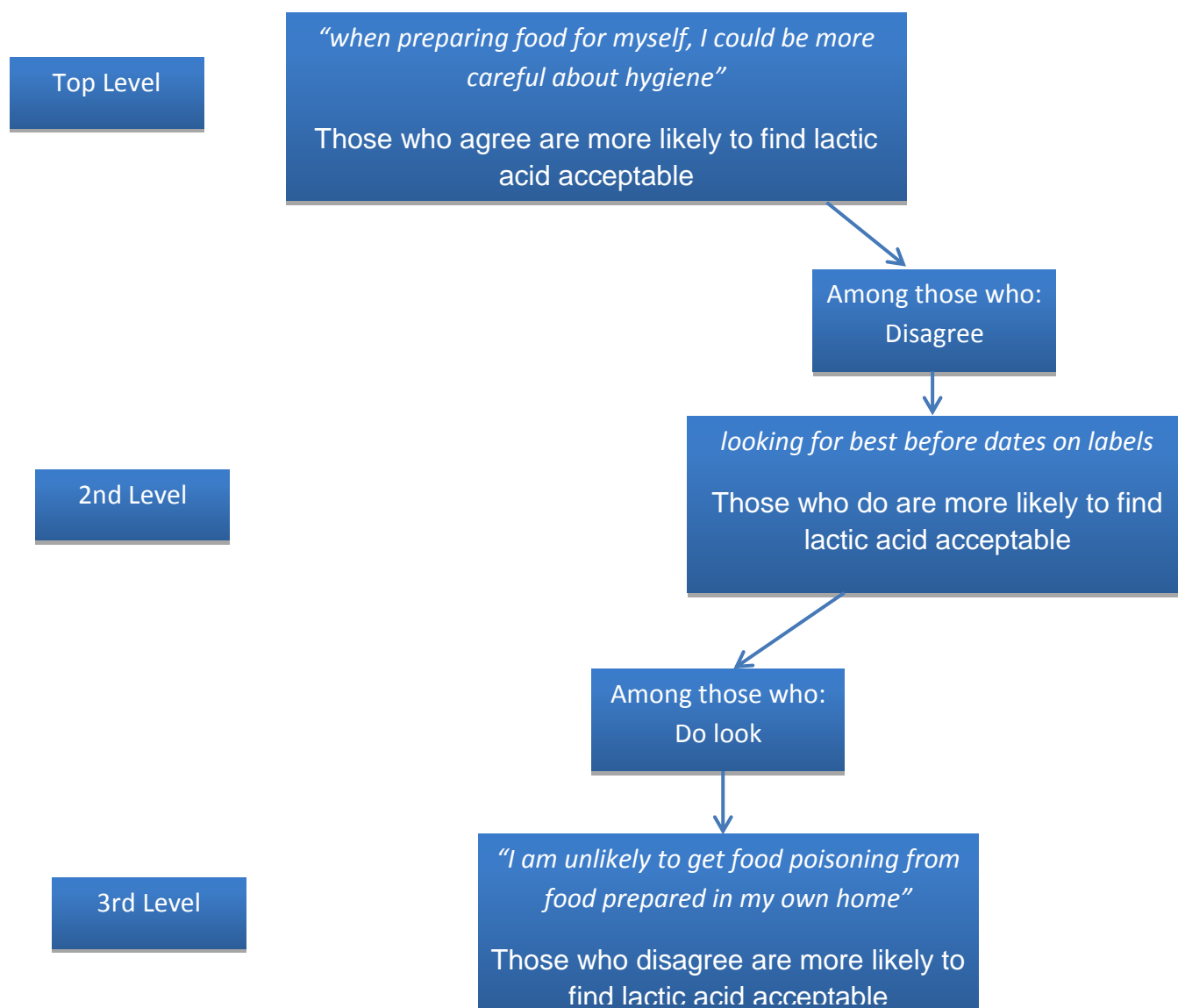
The frequency with which variants of this variable crop up in the various CHAID analyses outlined here and below suggests that looking for information on labels could be a surrogate for generally being concerned about what one eats, and wanting to know more about what one is eating. However, there is a question in the

questionnaire asking respondents how often they looked at labels on food and this never appeared in the CHAID at any time. This suggests that, although looking at different things on labels did crop up several times in the CHAID, it is the specific information being looked at that is the discriminating variable, rather than a general distinction between those who do and don't look at labels at all.

In this particular case one hypothesis is that there is a specific connection – people looking at best before dates may be looking for reassurance that the product is not a food poisoning risk, and so may be more in favour of a way of reducing the risk by treatment.

Finally, amongst those who do look at best before dates CHAID identifies a further discriminating variable: whether they agree or not with the statement “I am unlikely to get food poisoning from food prepared in my own home”, with those who disagree much more likely to find lactic acid acceptable (24% v 13%). This makes perfect sense – if you think you **are** at risk of food poisoning from food you cook at home, then you are likely to want to favour something that will reduce that risk.

Figure 1: CHAID tree on initial response to lactic acid treatment



4.6.2 Initial response to rapid chilling

A CHAID analysis was also conducted on the acceptability of rapid chilling, from which broadly similar themes emerged. These are summarised in Figure 2. The first level variable was again what people looked for on food labels, this time concerning eggs. Those who said they looked to see if eggs were free range or barn were more

likely to find rapid chilling acceptable than those who didn't look at labels at all, or who didn't look for this specific information (59% v 49%).

This may be because people who are concerned about avoiding battery eggs are also more likely to be concerned about the risk of food poisoning, and as rapid chilling is a "natural" treatment, it is likely to be acceptable to them.

For those who **do** look to see if eggs are free range or barn the next discriminator is the statement "It's just bad luck if you get food poisoning", with those who agree with this statement much less likely to find rapid chill treatment acceptable than those who disagreed or were neutral (45% v 63%). This seems perfectly logical: there is little point in treating food if you think food poisoning is purely a matter of chance.

Going back to those who **don't** look to see if chickens are free range or barn, the next explanatory variable for the acceptability of rapid chilling was the statement: "for me, most of the time, food should be as quick as possible to prepare". Those who agreed, or were neutral, were more likely to find rapid chilling acceptable than those who did not agree (53% v 45%). Again, this is perfectly logical – if you want food to be quick to prepare then food that is treated so that less care is needed in its preparation will seem a good idea.

For those who **agreed** about food being quick to prepare, the next level down was the variable about how often they cook or eat beef, and as with lactic acid treatment it is most probable that this is a chance finding, in the absence of any theoretical explanation. For those who **disagreed** with the statement, the next variable is again whether they look for sell-by dates, as was seen above with lactic acid treatment. But this time those who do look for them are **less** likely to find the treatment acceptable, rather than more likely as had been the case for lactic acid treatment.

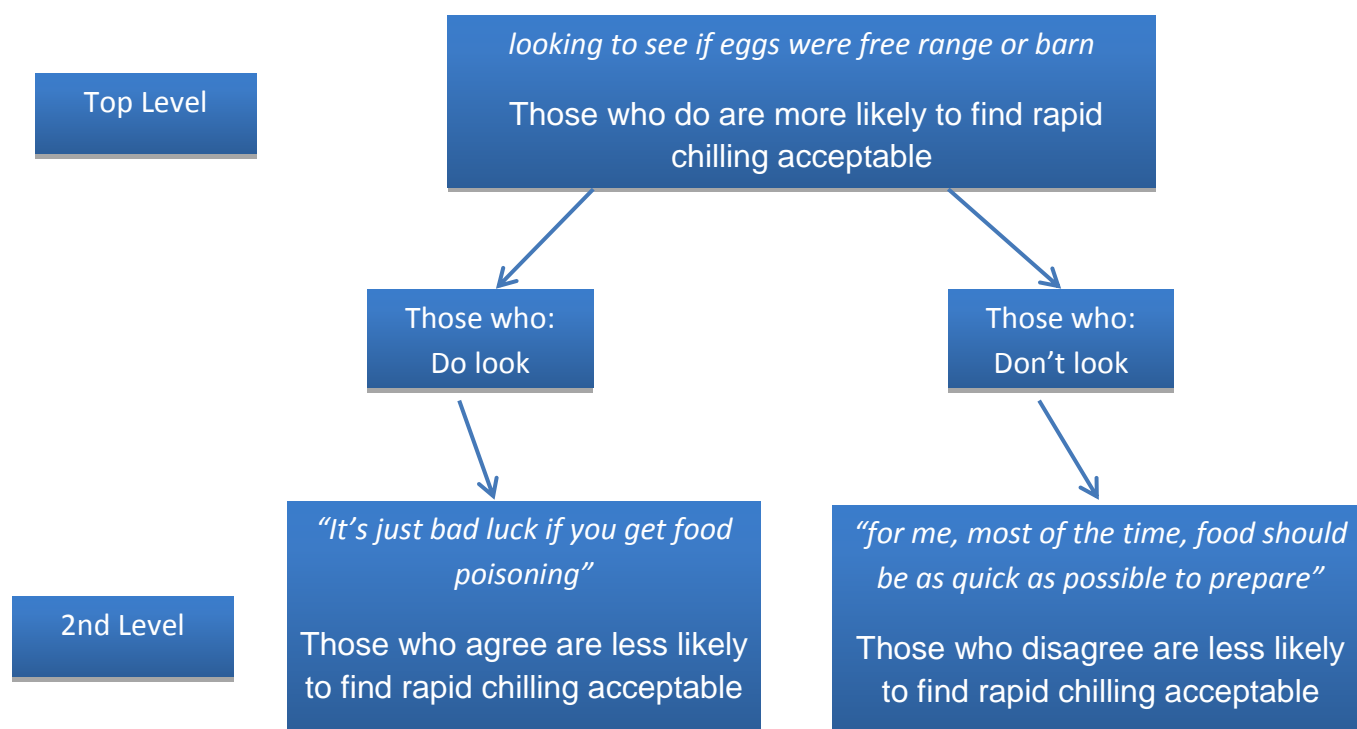
This seems a complete contradiction, but this is where the hierarchical nature of the CHAID analysis must be born in mind. On lactic acid, looking at best before dates was a discriminating variable only for those who did not think they could be more careful about hygiene. In the case of rapid chilling, it was a discriminating variable only for those who don't look to see if eggs are free range **and** who didn't think food should be as quick as possible to prepare. Since these are very different groups of people it is not surprising that there should be apparent inconsistencies. As a

generality, the further down the CHAID tree one goes, the more chance there is of chance findings.

If a variable has a strong influence on people's opinions it would probably appear consistently throughout all the CHAID trees. The fact that variables did not do this on the Campylobacter CHAID trees is in line with the simple cross-tabulations, which showed relatively little variation between sub-groups.

This may be because the survey asked people about something that they had probably never thought about before.

Figure 2: CHAID tree on initial response to rapid chilling treatment



4.6.3 Final response for lactic acid treatment

The third CHAID analysis was on those who considered lactic acid treatment acceptable after the final piece of additional information – the point at which the proportion considering it acceptable was at its highest.

In this analysis the key explanatory variable was whether people looked at labels to see if food was organic, with those who **do not** look more likely to consider the treatment acceptable (55% v 41%). This is logical enough, since lactic acid seems the opposite of organic, and presumably this association persisted even after people had received a lot of reassuring information about the treatment.

Following down the tree from those who **do** look to see if food is organic, the second level variable is whether people looked at labels to see if eggs are free range/barn or not, and again it is those who **do not** look who are more likely to find treatment acceptable. This is entirely in keeping with the first level, but the association is the opposite of what was found in the CHAID tree on rapid chilling. Again, if opinions are

somewhat inchoate, then CHAID analysis is less likely to find consistent associations.

Following the tree down from those who **do not** look to see if food is organic, the next variable is age, with younger people more likely to consider treatment acceptable than older ones. This is exactly as was seen with the simple cross-tabulations.

Finally, among those who don't look for organic, and who are in the younger two age groups, the final discriminating variable was whether they bought most of their meat from a supermarket, with those who do more likely to consider treatment acceptable than those who don't (67% v 50%).

4.6.4 Buying treated chicken

For the CHAID analysis on the question on whether people would prefer to buy treated or untreated chicken, the variable that best explained the difference was, as with the initial question on lactic acid, whether people could be careful about hygiene when cooking at home: those who agreed this was true were more likely to buy treated than were those who disagreed (43% v 34%).

This was the most complex of all the CHAID trees, with multiple branches at all levels. For those who agreed they could be more careful about hygiene the next most important explanatory variable was whether they looked at food labels to see where the food had come from, with those who **do look** much less likely to choose treated meat than those who don't (35% v 46%).

For those who **do** look where food comes from the final variable was the statement about only getting food poisoning at home if you don't cook food properly: those who agree were more likely to choose treated meat. For those who **don't** look where food has come from the final variable was whether they looked on the label for ingredients, with those who do less likely to buy treated chicken.

Going back to the top level variable, for those who **disagreed** with the statement about being more careful with hygiene the second level variable was whether they look at labels to see if it is recovered meat. Those who do look were less likely to buy

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treated, continuing the general theme seen most times this variable has appeared in the CHAID tree.

Finally, for those who **do not** look to see if meat is recovered there is one final variable, with those who buy from a butcher's less likely to buy treated meat.

5 CONCLUSIONS

5.1 Survey objectives

As described in section 1, the survey was designed to provide quantitative survey data on UK consumers' views relating to:

1. understanding and awareness of Campylobacter;
2. attitudes towards potential slaughterhouse decontamination treatments for poultry and beef, focussing on lactic acid;
3. attitudes towards potential labelling used to discourage washing of poultry.

The purpose was to inform the FSA's Campylobacter Risk Management Programme and also discussions about proposed changes to EU legislation on permissible meat decontamination treatments.

The data from the first objective were to provide contextual information for objectives 2 and 3, however objective one was dropped during the development phase of the survey (see section 2.3). This was because it became apparent in the focus groups that while the awareness of food poisoning generally was quite high, awareness of Campylobacter specifically was so low that it was decided there was little point in asking about it in the quantitative survey. Given that Campylobacter is the most common cause of food poisoning in the UK some might find this surprising, but the findings of other research, such as the FSA Campylobacter Citizen's Forum, are similar.

The second objective was met in full with data showing that consumer responses on the acceptability of different raw meat decontamination techniques were mixed:

- immediate reaction to lactic acid and ozone treatments was strongly negative
- immediate reaction to hot water/steam treatment was neutral
- immediate reaction to rapid chilling treatment was positive
- the acceptability of lactic acid treatment rose markedly when more information was given, and became positive overall

- the acceptability of rapid chilling treatment rose markedly when people were told treated meat could safely be frozen after purchase

The terms lactic acid and ozone alone provoked strong negative responses thus suggesting that they would have a low acceptability amongst UK consumers, although provision of extra information appeared to mitigate the negative response to lactic acid. The two physical treatments were viewed more positively, especially rapid chilling. Attitudes towards the various treatments, however, were not uniform across the sample with some variation by age and gender, and issues relating to familiarity and terminology also influenced reported acceptability.

Questions relating to the final objective to examine attitudes on labelling to discourage washing of poultry were dropped during the development stage because of the need to reduce the length of the questionnaire. However, questions were retained on general usage of labels and on labelling of meat that had been subjected to lactic acid decontamination treatment to reduce the risk of food poisoning.. Responses to the latter showed a strong consensus amongst respondents that meat that had been treated should be labelled with a preference for the most detailed option.

5.2 Robustness of the data

These data derive from a random probability survey, design yielding a sample representative of UK consumers in terms of age, gender, and region with a total sample size of just over 2,000. The response rate was low, but the demographic breakdown of the sample was generally close enough to that of the UK population as a whole to suggest that the low response rate has not damaged the sample's representativeness.

The survey questionnaire was piloted to ensure validity and reliability and comparison of responses with similar questions in the FSA's Food and You survey show very similar results. This suggests that overall the results of this survey are sufficiently robust for meaningful conclusions to be drawn from them regarding consumer attitudes towards these different raw meat decontamination treatments.

5.3 Comparison with other studies

While there is large literature⁸ examining consumer perceptions and practices and the factors that influence these in relation to a variety of food safety risks, the scoping study identified only two comparable studies that looked specifically at meat decontamination treatments, one conducted in Denmark and the other by Which? magazine in the UK. The Danish study found that freezing and steam/hot water treatments were more acceptable to consumers than chlorine. Similarly, the Which? Study found consumers were more likely to buy chicken treated with a physical treatment – steam – than with a chemical one – acid wash. Both studies thus endorse the findings of this study that the two physical treatments were, initially at least, more acceptable than the two chemical ones.

⁸ For an overview see: Smeaton, D.; Draper, A.; Durante, L. and Vowden, K. (2010) *Development Work for Wave 2 of the Food Issues Survey*. London: Food Standards Agency



APPENDICES



APPENDIX A
LITERATURE REVIEW



**CONSUMER PERCEPTIONS AND UNDERSTANDING OF CAMPYLOBACTER
AND FOOD SAFETY: LITERATURE REVIEW**

February 2012

EXECUTIVE SUMMARY

Background

The Food Standards Agency (FSA) bears overall responsibility for ensuring the safety of the nation's food and food practices. As part of its on-going work, the FSA has prioritised tackling Campylobacter, the biggest cause of food poisoning in the UK; at the same time, public awareness of Campylobacter, and understanding of how to mitigate the risk of Campylobacter food poisoning, are currently low.

The FSA has therefore commissioned further research into public understanding of Campylobacter, consumer awareness of the risk of Campylobacter food poisoning, and public attitudes towards slaughterhouse decontamination treatments, particularly for raw chicken and beef.

Scope of Study

This literature review is part of a broader project designed to enhance understanding of consumer perceptions around food safety in general, and Campylobacter in particular. It also investigates public awareness of, and acceptance of, decontamination practices and treatments, both in the home, and in the commercial environment.

The review comprises a survey of the available literature on the subject of consumer attitudes/understanding of food safety, food practices, production processes, and treatment options. It gathers existing information, points to gaps and limitations in the literature, and offers findings and recommendations for further research and actions in relation to Campylobacter and food safety.

Findings

Consumers are aware that raw meat products are a potential food poisoning risk, and understand that raw chicken and beef are the most prominent risks. They understand that the risk is bacterial in nature, and to some extent understand the effects of bacterial contamination of raw meat products. Specific awareness of *Campylobacter* (now the most common cause of food poisoning in the UK) is limited.

Domestic food safety practices are inconsistent; consumers self-report good practice, but observational studies suggest that the reality is occasionally less hygienic. As more of the population are seen as vulnerable to the effects of foodborne infection, there is a need for more and better guidance and information on good food practice in the home.

There is some public resistance to innovative decontamination treatments. This is partly due to a lack of awareness and understanding (which implies a lack of adequate information and advice), and partly due to the unfamiliarity of those processes. There is some evidence to suggest that the language and context of information on innovative food processes is important to further public acceptance.

INTRODUCTION

Background

The Food Standards Agency (FSA) is the national authority responsible for ensuring that the nation's food is safe to eat. This responsibility covers the entire journey of food, from farms, slaughterhouses and manufacturing facilities, through the retail and catering trade, to the way people store and prepare food in their own homes.

One of the priorities identified by the FSA within this overall objective is dealing with *Campylobacter* in chicken; research already conducted has revealed a lack of specific awareness of *Campylobacter*, despite the generally high level of public awareness of the health risks latent in chicken that has not been properly stored, handled or prepared.

Participants in the FSA funded citizens' forums held in 2010 expressed concerns that some of the possible ways in which slaughterhouses might minimise the *Campylobacter* risk - chlorine washes, lactic acid spray and freezing – might have a deleterious effect on the taste or texture of the meat.

The FSA has commissioned research to give a quantitative assessment of consumer understanding relating to *Campylobacter* and attitudes towards potential decontamination treatments to reduce the surface bacteria on raw meat. This literature review forms a part of that wider project. The research is part of the Food Standards Agency's *Campylobacter* Strategy, to reduce the incidence of *Campylobacter* infection in humans. The research was commissioned in December 2011 and results will be delivered in October 2012.

Method and Scope

The purpose of this literature review is to provide a basis for consideration of the existing research into food safety, and in particular how it informs, and impacts on, the quantitative and qualitative analysis to be undertaken as part of this project. Because the existing literature is broad in scope (and somewhat thin in relation to the specific aims of this project), the literature review process is likely to offer useful

material to support focus group and/or survey work for a range of questions leading to more qualitative and quantitative appraisals of consumer attitudes and awareness.

The academic literature on food safety and food hygiene is vast, and unwieldy; fortunately, a number of reviews and meta-analyses have been carried out, in an attempt both to integrate findings, and to point to gaps in the existing literature. Therefore, this document is in many respects a 'review of reviews' and is not intended as a systematic review of the available literature; given the fragmented nature of the research available, and the time constraints of the project, this would appear to be the most fruitful approach.

A recent development study for the FSA (Smeaton et al, 2010) sets out the criteria which researchers need to be aware of when conducting studies in this area. These include: conditioning; social desirability bias; measurement of low salience behaviours; telescoping; response bias; knowledge questions; and the effects of question location and order.

Where data on specific themes are available, they have been investigated for relevance and utility. Broader themes have been addressed by gathering and integrating findings from a range of studies into consumer perceptions of food safety, domestic food safety practices, attitudes to particular food products, and awareness of both general and specific food safety risks, as represented by products and processes, potential foodborne pathogens, and consumer strategies and responses in relation to those themes.

This review was based on analysis of thirty-three main documents relating to food safety in general, and *Campylobacter* in particular, identified using Google Scholar. Seven of those documents were themselves reviews of existing literature, referencing a further twenty-four studies of varying relevance. Of the remaining studies, the majority were qualitative research studies on specific aspects of food hygiene and safety, for publication in relevant journals; reviews of research

undertaken for governmental and inter-governmental agencies; and industry-oriented journal articles.

- The criteria for selection of sources were as follows:
 - Published in English
- Publication date: 2000 to present
- Study/survey focus:
 - Knowledge and understanding of *Campylobacter*
 - Attitudes towards potential slaughterhouse treatments for reducing contamination in raw meat (specifically poultry and beef)
 - Attitudes towards labelling raw meat and poultry which has been treated with decontamination treatments, lactic acid in particular
 - Attitudes towards messages designed to prevent the risk of cross-contamination in the home
- Population: studies/surveys of the general adult population (> 16 years)
- Disciplines and methodologies: include all academic disciplines and their associated methodologies which offer utility in the development of survey questions, namely psychology and social psychology, sociology (to include both quantitative and qualitative social research), social anthropology, and market research
- Location: studies/surveys conducted in the UK or comparable contexts (the NICE 2009 guidance on assessing applicability will be used).

Findings and recommendations

The findings and recommendations arising from this review are set out in full in the conclusion section of this document. Broadly, the review has confirmed the scarcity of directly relevant research; nonetheless, some conclusions of relevance to the project can be adduced (the findings in the conclusion of this review are indicative of the information available, and the gaps in the research literature). Identification of gaps in the existing literature points to opportunities for further research in the area,

and the need for a more focused approach to Campylobacter in terms of information and awareness of the potential inherent risk, and best practice for mitigating the risk, both in domestic and commercial settings. Please consult the Findings and Recommendations sections of this document for specific references to gaps in the existing literature.

Consumers are aware of raw meat products as potential food risks, but are less aware of Campylobacter than other bacteria; this should be understood against the generally low perception of risk reported by UK consumers. The main sources of information about food safety are the mass media, and more awareness comes from negative (news of outbreaks of illness) than positive (reports on innovative treatments and technologies) news stories.

There are some barriers to acceptance of new decontamination treatments, and this is coupled with low awareness of available and potential treatment processes (for example lactic acid). Domestic food practice shows room for education and improvement, as does awareness and understanding of the effects of food poisoning. The language and context in which food safety information is presented is key to understanding and acceptance.

References

This document does not include a large number of specific references to individual studies. There are two principle reasons for this: firstly, many of the studies which form the informational basis of this review are themselves reviews of other work in a vast and unwieldy field, and their findings are broad rather than specific; secondly, the findings presented here are more often a consensus drawn from multiple studies than specific findings from individual studies. Where references are included, they are to the review literature, rather than to the individual studies contemplated by those reviews. This approach stems from the nature of the review process, and the time constraints on this element of the project.

LITERATURE REVIEW

Risk

Risk is understood differently by laypeople and scientists. In common usage, 'risk' is synonymous with 'hazard' or 'danger'; it has also been described as 'the combined evaluation that is made by an individual of the likelihood of an adverse event occurring in the future and its likely consequences' (Lupton 2004), although this description seems to conflate common and technical perceptions. In technical discourse, risk is understood as a function of probability, specifically the probability distribution of a variable; it does not carry a negative connotation, despite the fact that most risk analysis is predicated on adverse events.

The term 'risk' is generally understood in the food safety environment as 'the function of the probability of an adverse effect, and the magnitude of that effect, consequential to a hazard in food' (this is the definition used and accepted by, for instance, the WHO). Public understanding of food risk, similarly, is of both a hazard inherent in food itself, and the potential effects of that hazard; this mirrors the general usage of the term (Horlick-Jones et al, 2009).

Consumer attitudes to food safety are part of a broader matrix of attitudes towards risk in society and life. As a result, there is no public consensus position on food; rather, perceptions are dependent on individual responses, and classes of responses, to specific stimuli, set against those broader attitudes. In general, consumer attitudes to food safety and risk suggest a risk/benefit approach, rather than a simple risk-averse approach. Some studies (e.g. Smeaton et al, 2010) suggest that consumers employ a 'trade-off' approach to food safety issues.

Studies on risk perception in food tend to divide consumers into broad groups or categories. One might summarise this categorisation in terms of: *conscious consumers*, who see themselves as having an informed view of food and food safety, and who adopt strategies in terms of purchase, storage and preparation

which reflect this informed view; *traditional consumers*, who report worries about food and food safety, but who tend to rely on learned or inherited behaviours towards purchase, storage and preparation; and *convenience consumers*, who evince less sensitivity to food safety issues, and who tend to purchase and consume a higher proportion of pre-packaged and pre-cooked food items, and a lower proportion of raw food (eg Yeung, Morris 2001, Wilcock et al 2004) These categories are neither universal, nor official, but reflect the general thrust of research.

Perceptions of the risk of contracting food poisoning

The main reported sources of information for food safety for consumers are media-based. Media reports of food poisoning outbreaks, and of government and industry responses to those outbreaks, are consistently reported as influencing factors. Media attention to bio-technology, and innovations in food processing, are also reported as influencing factors, despite the fact that these processes do not directly impact on food poisoning per se. Food poisoning outbreaks large enough to attract media attention tend not to be domestic.

As a consequence many consumers are unaware that the home is a likely site for the risk of food poisoning (eg Redmond et al 2003). This finding ties in with the clear trend of consumers perceiving food poisoning as more a foreign than a domestic problem. Self-confidence is a limiting factor in risk perception; however, it is worth noting that self-confidence is associated with reduced risk by consumers, but increased risk by producers. Optimism bias (the belief that others are more at risk than oneself) is also a limiting factor.

Although food experts rank the risk of microbiological hazards as high, consumers attribute higher risks to food additives, pesticide residues, and inorganic contaminants; this suggests that consumer perceptions of food risk are concentrated on longer-term health risks (cancer, and chronic diseases) rather than on food poisoning per se. Consumers are also less likely to attribute food poisoning risk to domestic food-handling and hygiene practices; there is a tendency to assume that infections are mostly foodborne and result from inadequate cooking or storage,

whereas in reality, most infections in the home result from person-to-person contact and inadequate hygiene practice.

Consumers do report an intention to modify purchase behaviour in response to the perceived level of risk, as it relates to specific food items, and this intention is more evident in the wake of sustained media attention to problems around a particular foodstuff. This reflects the notion of the 'teachable moment' (Marris et al 2001) – the idea that people are more receptive to education and information following news of major adverse events. But the loss of public confidence associated with outbreak reports is reflected differentially in terms of response behaviour.

Consumer concerns in relation to foodborne infections can be expressed in terms of perceived 'personal losses' (Yeung et al 2003): these are most often reported as loss of health, time (presumably working time), finance, lifestyle, and 'taste losses'. The level of concern is influenced by demographic factors, and more general attitudes to food and health. Those people who self-report as health-conscious are more likely to perceive risk in food, but are also more likely to express confidence in their ability to deal with the risk through good practice in the home.

Understanding of Cross-contamination

Food safety experts show less confidence in consumers' capacities for understanding and dealing with food risk than the consumers themselves. Irrespective of obvious bias, there is some ground for this opinion; while consumers consistently self-report responsible food safety behaviour; observational studies suggest that large numbers of consumers engage in unsafe food-handling practices. The risk of cross-contamination is particularly high where such practices occur.

The amount of available information on food-handling behaviour in the home is limited, but the data as it stands shows a clear mismatch between consumer attitudes and perceived knowledge, and the practices adopted. This implies a substantial gap between practice and consumer perception of that practice, in

relation to the risk of cross-contamination. Public awareness of issues of cross-contamination is higher in relation to public institutions, such as hospitals, food industry plants, and restaurants.

Vulnerable groups (the elderly, neo-nates, pregnant women, and people whose immune systems are compromised by illness) are increasing as a proportion of the general population; estimates from the US and the UK suggest that approximately 20% of the population of these countries could be classified as vulnerable. These groups are particularly susceptible to the dangers of cross-contamination; however, observational studies strongly suggest that the presence of one or more member of a vulnerable group in the home does not result in enhanced food-handling practices.

There is little evidence available about public knowledge of medicine in general, and food poisoning issues in particular. Consequently, it is difficult to assess the understanding of a problem such as cross-contamination, except through interpretation of indirectly linked studies into food safety perceptions and practices.

Understanding of the Effects of Food Poisoning

A brief internet search for food poisoning brings a large number (over 37 million) of sites offering information and advice. These sites are a mixture of official and regulatory bodies, medical help sites, and postings by individuals. Despite the heterogeneity of sources, there is a consensus around symptoms (there is some divergence in relation to treatment, but more orthodox sites are again in general agreement).

The commonly-listed symptoms of food poisoning are; nausea, abdominal cramping, diarrhoea, head or muscle aches, and fever. Symptoms may present from 1 – 70 days after contact with the responsible pathogen. While the majority of cases are self-limiting, the effects may be considerably more serious in some sufferers, and a small proportion of cases are fatal. This symptom list (and the treatment protocols listed below) was taken from the NHS Choices website (<http://www.nhs.uk/conditions/Food-poisoning/Pages/Introduction.aspx>)

Treatment for food poisoning usually consists of fluid replacement, and treatment with replacement electrolytes (eg sodium, potassium, magnesium, and chloride). Antibiotics are occasionally prescribed (either in more serious cases or where vulnerable persons are involved). Symptoms typically persist for 3 – 5 days in most cases.

As outlined in the previous section, evidence about public understanding of medical issues is somewhat sparse. Where studies have referred to knowledge of food poisoning, they suggest that consumers are usually aware that the effects of food poisoning present as gastro-intestinal symptoms. It is likely, however, that specific understanding of food poisoning is subsumed in a broader (and somewhat confused) perception of 'food danger', a category which includes BSE, fears around bio-engineered and functional foods, and a range of more exotic illnesses understood as having a foreign provenance.

Acceptability of Meat Decontamination Treatments

There is a clear hierarchy of risk in relation to raw meat products. Chicken is consistently seen as the 'riskiest' of all standard raw meat products. Beef is perceived as offering a lower risk; it appears that the BSE scare is generally taken as a one-off event. Chicken contamination, however, is understood as inherent in production practice. As for the pathogens, consumers are more likely to identify salmonella than Campylobacter, and both specific pathogens are subsumed into a larger, vaguer picture of microbial risk.

Levels of public concern about food products created using innovative processes and ingredients demonstrate considerable diversity. Process terminology is a barrier to both confidence and understanding; where consumers are familiar with the terminology of a process, levels of confidence rise, although this effect is off-set by 'rational ignorance' (the preference shown by consumers for partial information about subjects such as food processing (McCluskey and Swinnen 2004)).

In terms of decontamination treatment for Campylobacter in beef and chicken, European consumers display limited knowledge about the food technologies in place (it should be stressed that existing studies show most evidence for consumer knowledge of GMO and irradiation; other technologies are not well studied); awareness and acceptance of innovative decontamination treatments is similarly limited. UK consumers appear to have the lowest levels of risk perception in Europe; this may relate to the high levels of beef and chicken consumption in the UK. Research has shown that people who consume high levels of a particular product are more accepting of treatment processes relating to it, and concomitantly less likely to inquire into those processes

Consumer concerns around meat treatment tend to relate more to a need for reassurance on issues such as taste, texture, appearance and smell, than to the 'nuts and bolts' of the processes themselves. Colour is an important indicator of quality (and thus safety) for many consumers. Criteria such as country of origin, and point of sale, are more regularly reported as indicators of food safety than treatment processes (Marris et al, 2001; Bernues, 2003).

Decontamination Treatment Labelling

About 50% of UK consumers self-report that they pay attention to food labelling when shopping (this figure varies across studies to some extent). Constraints, such as the amount of time available for shopping, affect the amount of attention given to labelling. Those consumers who look at labelling tend to look for food origin (as mentioned elsewhere in this review, food origin is clearly a barometer of food safety) and food safety.

Many consumers report confusion (often characterised as 'information overload') in relation to food labelling. This can lead to a lack of trust in food labelling, and this lack of trust can extend to food producers and regulators. Consumers appear more likely to act on food safety labelling where it relates to point of origin and ingredients (this presumably implies purchase decisions) than guidance on food handling in the home (which would imply changes in domestic behaviour).

Chicken and beef engender higher levels of concern about labelling information than other types of meat; this perhaps suggests a consumer view of these meats as inherently more risky than other meats. Concerns about point of origin and rearing methods (free range versus intensive rearing, typically) overshadow contamination issues; indeed reassurance around rearing often acts as a guarantee of cleanliness and safety.

Consumers who express an interest in, and concern about, food labelling typically demonstrate a higher awareness of food safety issues; but, equally, their interest in labelling is general rather than specific. Those who express concern about contamination are often reassured by labelling which indicates origin; this suggests that understanding of particular decontamination processes is not a priority.

Familiarity with processes, and the terminology used in those processes, is a factor in consumer acceptance; innovative processes are perceived as less acceptable, and information on those processes less reassuring. Labelling is, however, seen as a central feature of the 'food safety information infrastructure' (Taylor and Batz, 2008). Taylor and Batz also suggest, as do a number of authors, that the source of information, is an important criterion for concerned consumers.

Processes that can be presented as 'natural' are more readily accepted, and the terminology involved is less intimidating to consumers. Processes already in place in other areas of food production are also more easily accepted. This suggests that, where a process is innovative in one area of food production, but has been used elsewhere, the familiarity engendered in one area may be transferable to another, both in terms of the process itself, and information relating to it.

Preparation Guidance on Packaging

There are considerable differences in attitudes to food preparation guidelines, depending on the nature of the product. In general, consumers in the UK show little interest in the cooking instructions on fresh meat products. Most people assume knowledge and 'control' of the cooking process when it comes to raw meat (Yeung

et al 2003). Studies suggest that consumers see information on storage, preparation and cooking as an important aspect of food labelling; but those same studies indicate that consumers do not use this information very often.

Studies on the use of preparation instructions differ as to how widely such instructions are looked for or used. One study in the USA suggested that about half of purchasers actually look for information on storage, preparation and cooking while shopping for meat, poultry and egg products. Another study from Ireland suggests that only 12% of respondents reported referring to cooking instructions; and fewer still (9%) referred to storage instructions.

Studies also suggest that preparation instructions on raw meat products are often consulted on first purchase, and not subsequently. This reflects the evidence on self-confidence and control in the home. The evidence also suggests that consumers consider the utility value of preparation and cooking instructions as varying from product to product.

Some Specific Themes

Awareness of Campylobacter as a potential cause of food poisoning

The incidence of Campylobacter infection has increased up to fourfold in developed countries in the last twenty years. Despite this fact, awareness of Campylobacter is low, and particularly low in the UK; across a range of sample countries, UK consumers are the least aware of Campylobacter. Salmonella, Listeria, and E. coli all have a higher risk profile than Campylobacter.

Campylobacter is now the most common cause of foodborne infection in the UK, both domestically and institutionally. In response to specific questions, however, UK consumers are more likely to answer in terms of general knowledge; that is, microbial harm is 'the risk', rather than any particular pathogen.

Awareness of potential contamination of raw beef and poultry at the point of sale

Most consumers (it is not clear from the literature if this means consumers in general, or those who regularly buy and cook raw beef and chicken products) are aware that raw meat and poultry are potential sites of bacterial risk (again, it is not clear in the case of beef whether this is a specific concern or part of a more generalised fear).

Point of origin and point of sale are seen as potential mitigating factors in the risk picture. Supermarkets are often seen as superior in this respect. Whether this is because consumers are less likely to see meat out of its packaging in a supermarket is not clear from the literature. There does not seem to be any substantive research showing which countries or locations are perceived as 'safer' points of origin, or how this opinion is arrived at.

A recent Which? Report found that 20% of chickens from UK supermarkets revealed *Campylobacter* contamination, and 17% contamination with *Listeria*. However, these findings need to be viewed with some caution, as the report's sampling and methodology is unclear (Which? 2012).

Consumer concerns around point of sale contamination

Point of sale is an important criterion in consumer choice. Studies strongly suggest that consumers make decisions on food safety based on point of sale choices. This finding is broadly in line with data suggesting that the environment in which food products are seen is a determining factor in appraisals of quality, hygiene and safety.

Understanding of the mechanisms of infection

There appears to be no research specific to this question. However, studies on food hygiene have indicated that there is some level of public awareness (poorly defined in the literature) of what constitutes food poisoning, and that this awareness includes the knowledge that the symptoms are gastro-intestinal in nature. In other

respects, the literature is ambiguous; self-reported knowledge of good practice might indicate awareness of how infection is propagated, but observational studies might indicate that the lack of effective hygiene practices is reflective of low awareness.

Consumer Views on Decontamination Treatment for Raw Chicken and Beef

Research suggests that, in general, consumers do not agree with the practice of decontamination (this finding is consistent across a number of studies referenced in this review, e.g. Marris et al (2001), Wilcock et al (2004), van Wezemael et al (2011), Mazzocchi et al (2008)); however, the level of rejection varies across the population, with some people rejecting the idea outright (a small majority of respondents in some studies) and others demonstrating a graded response consistent with other factors such as the familiarity of the treatment, and the perceived 'naturalness' of it.

Views on Specific Treatments for Raw Chicken and Beef

This theme shows up a substantial gap in the literature (the academic literature at least; it may be that producers have done some research in this area). There is empirical data around consumer response to irradiation, and one study (Közen et al 2011) on more specific treatments (eg freezing and steam treatments). This looked at the acceptability of freezing, steam and hot water, and chlorine treatments, and found freezing and steam/hot water were more acceptable than chlorine. Irradiation is seen more favourably in the US than the UK, and Europe generally. Even in the US, studies have suggested that less than half of consumers would be willing to buy irradiated meat, and fewer still would be willing to pay a premium for food so treated.

Views on Lactic Acid Treatment for Raw Chicken and Beef

There is no specific research into the acceptability of lactic acid as a meat decontaminant. An article in Which? magazine (Which?, 2012) states that 60% of consumers in their survey "were unlikely to buy chicken that had been sprayed

or washed with a mild acid such as lactic acid". This was similar to the proportions who were unlikely to buy chicken treated with irradiation or chlorine (59% and 67% unlikely to buy respectively), with steam treatment the only one acceptable to a majority (59% were likely to buy). However, a PowerPoint presentation of the survey results supplied by Which? suggests that the question asked in fact referred only to "mild acid" and so the results cannot strictly be regarded as being about lactic acid, and indeed the comparison of a vague term, "mild acid" with the far more specific "chlorine" may well have affected the results.

Some research has been carried out into the possibility of using lactic acid in antibacterial treatment for apples, and the results demonstrate ambivalence on the part of consumers. Whether this ambivalence is the result of unfamiliarity with techniques or terminology, or simply part of a broader attitude towards 'Frankenfoods', is unclear from the literature.

Views about Labelling Information on Decontamination Treatments for Raw Chicken and Beef

As previously noted, research on food labelling, and specifically on the labelling of meat and poultry products, offers ambiguous findings. The variation in response from country to country strongly suggests that the information culture in a particular country is an important factor in consumer response. Those who want information want information on every aspect of the product. Again, influencing factors such as 'rational ignorance' and optimism bias play a part. Overall, this represents another gap in the literature.

Views on Specific Labelling about Antibacterial Treatment

There appears to be no research into this topic. Given the comments about labelling in general, it is likely that the concept of specific labelling needs to be tested; this may be more the provenance of marketing on the part of producers than academic study. But data would certainly inform broader research themes into food safety.

Views on Lactic Acid Treatment Labelling

There is no specific data on this topic apparent in the literature. Since no data is available on antibacterial treatment labelling in general, it may be that a broader exercise is required initially. From the small amount of research into acceptable language in labelling, it appears that use of a simpler, more generic term (for instance 'probiotic') may increase consumer acceptance at the outset.

Paying a Premium for Antibacterial Treatment of Raw Meat and Poultry Products

There is some evidence that consumers are willing to pay a small premium for safety; however, comparison of studies from different countries suggests that premium tolerance varies somewhat. Familiar and 'natural' treatments are more acceptable, so more likely to engender a positive response in terms of price. In the UK, consumers appear to be more willing to pay extra for evidence of good practice in rearing, and for food that looks healthy.

Paying a Premium for Lactic Acid Treatment

Again, the literature is silent on this topic. But note the comment about such terms as 'probiotic' on labelling above; reassurance in generic language may offer a clue as to how acceptance might be enhanced.

The Proportion of Consumers Who Refer to On-pack Safety Information for Raw Poultry

The proportion of consumers who refer to safety instructions on product labelling varies from country to country. The data from Ireland might be taken as loosely representative of attitudes in the UK (Miles et al 1999) (although the food cultures may differ to some extent, given that Ireland has a more rural population). If so, consumers who refer to safety information in the UK are likely to represent quite a small proportion of the buying public.

CONCLUSIONS

Findings

The literature on food safety issues is diverse and somewhat fragmentary. However, broad themes emerge, which potentially inform future study of related topics. As for the more specific themes contemplated by this project, they mostly correspond to gaps in the existing literature. Consequently, the 'findings' section of this conclusion will relate, generally, to the broader themes investigated, and the 'recommendations' to identified gaps and limitations.

Raw meat products: risks and practices

- Consumers are aware that raw meat, and in particular raw chicken and beef, are potential food safety risks
- Consumers are less aware of Campylobacter than eg Salmonella or E. coli
- There is some awareness of the need for raw meat producers to address microbial risk in the production process
- There is some awareness of the need for domestic practices to minimise the risk of foodborne infection
- UK consumers (compared with consumers in the US and Europe) have a comparatively low awareness of risks in raw meat products

Awareness and understanding of foodborne illness

- Consumer attitudes to food safety are difficult to separate from broader attitudes towards risk
- Consumers are aware (but this awareness is not universal) that foodborne illnesses represent a health risk in the home
- There is some understanding of the nature and effects of foodborne infections and what food poisoning is

- Awareness of the identity of vulnerable groups is low, and consequently domestic practice is not enhanced for members of vulnerable groups
- The main consumer-reported sources of information on foodborne illness are the media
- Many consumers are unaware that the home is a likely site for food risk
- Consumers attach less importance to bacterial risk than to food additives and unfamiliar technologies (this may reflect a general feeling that food poisoning is less of a hazard than more long-term risks such as cancer)

Decontamination treatments, food safety information and labelling

- There is a low level of acceptance of food decontamination treatments
- Treatments perceived as familiar or 'natural' engender better acceptance levels
- Food labelling is understood as an important factor in food safety
- There is some inconsistency between reported awareness and observed practice in relation to food safety information
- The source of information is a key factor in whether people trust information
- Knowledge of the consequences of unsafe practices enhances understanding and adherence to safety guidelines
- High level consumers of beef and poultry are more accepting of treatment processes
- Terminology is an important factor in acceptance of treatment
- Food origin and point of sale are determining factors in consumer safety assessment

- Specific treatments may engender specific responses (positive or negative) due to pre-existing attitudes, reflecting previous experience, cultural and demographic variation, or responses to media-based information

Recommendations

Campylobacter as a food risk

- More information is needed on vulnerable groups; how they are identified by consumers, and how food safety practices affect those groups.
- More information is needed on how consumers rate and prioritise food safety information, and on the relative effects of positive and negative information
- Targeting specific user groups is a better method of information dissemination than targeting specific foods and processes
- More and better information on the public understanding of medical issues related to food poisoning is needed

Innovative decontamination treatments

- There is a need to promote public trust and credible information sources
- Putting information about treatment processes in familiar language is key
- Proposed treatments (eg lactic acid spraying) need to be given a higher public profile, in appropriate context
- Information about decontamination needs to be distinguished from bio-technology and food additives

Improving domestic practice

- There is a need to improve awareness and uptake of practice guidelines (especially the 'four Cs')

- Information should incorporate everyday context
- There is a need to raise awareness that the home is an environment where a whole range of hygiene-related practices take place
- The disconnect between food safety awareness, and food safety practice in the home, needs to be addressed

Appendix

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APPENDIX B

REPORT ON FOCUS GROUPS



**CONSUMER PERCEPTIONS AND UNDERSTANDING OF CAMPYLOBACTER
AND FOOD SAFETY: QUALITATIVE FOCUS GROUP FINDINGS**

1. Background

The Food Standards Agency (FSA) is the national authority responsible for ensuring that the nation's food is safe to eat. This responsibility covers the entire journey of food, from slaughterhouses and manufacturing facilities, through the retail and catering trade, to the way people store and prepare food in their own homes.

One of the priorities identified by the FSA within this overall objective is dealing with campylobacter in chicken; research already conducted has revealed a lack of specific awareness of campylobacter, despite the generally high level of public awareness of the health risks latent in chicken that has not been properly stored or prepared.

Participants in the citizens' forums held in 2010 (Food and You) expressed concerns that some of the possible ways in which slaughterhouses might minimise the campylobacter risk - chlorine washes, lactic acid spray and freezing – might have a deleterious effect on the taste or texture of the meat.

The FSA has commissioned research into consumer perceptions and understanding relating to campylobacter and potential decontamination treatments to reduce the surface bacteria on raw meat. The research is part of the Food Standards Agency's Campylobacter Strategy, to reduce the incidence of campylobacter infection in humans. The research was commissioned in January 2012 and results will be delivered in March 2012.

2. Method and Scope

The FSA's Citizens' forums have demonstrated that the way in which a survey describes processing interventions is likely to affect reactions to the processes themselves⁹.

⁹ <http://www.food.gov.uk/science/socsci/ssres/foodsafetyss/citforumcampy>

Two focus group discussions were commissioned as part of a scoping process which includes a literature review. The focus group discussions were designed to help achieve an understanding of how different content and language is likely to affect responses to survey questions about different decontamination treatments.

The objective of the groups focused on exploring how processing interventions should be described and whether – and if so, what - additional information would be required to support survey respondents' answers. The findings from the two focus groups should therefore be considered part of the questionnaire development process.

The group moderator made notes of key themes emerging during the discussions, and the recordings were subsequently listened to by experienced Research Works staff to draw out the main findings and note specific respondent quotes to support these findings.

3. Sample

Two focus group discussions were conducted, each of 1.5 hours duration with 8 respondents in St Albans on 13th February 2012. The groups were held at Research Works' viewing facility, and were video-recorded to assist with the analysis. In accordance with the Market Research Society Code of Conduct, all respondents signed their agreement to the group being recorded.

The recruitment criteria for each group were as follows:

- Group 1 – all respondents were from ABC1 socio economic groups
- Group 2 – all respondents were from C2DE socio economic groups
- A mix of male and female was achieved in each group
- A mix of ages and lifestages (i.e. with and without children, living with or without partner) was achieved in both groups
- A mix of ethnic minority background was achieved in each group
- All respondents ate meat regularly (at least once a week)

These are fairly standard criteria for conducting groups intended to represent the whole population when as few as two groups are being conducted. Respondents for the groups were recruited by specialist recruiters from the local population.

As is standard practice for group discussions, respondents were given a financial incentive to take part.

4. Main findings

4.1 Understanding and awareness of Campylobacter

Respondents in both groups were unaware of the different types of food poisoning, with Salmonella being the only type spontaneously mentioned.

Food poisoning seemed to be a generic term for 'feeling sick' or 'unwell' after eating something that 'hadn't agreed' with them. The seriousness of this was perceived to range from just feeling queasy to having to go to bed.

Food poisoning was attributed largely to undercooked food - and it was perceived as particularly important to cook chicken well. Respondents were also aware of the need for good food hygiene practice when handling chicken.

Undercooked pork was also mentioned as this was believed to cause tapeworm.

Perhaps surprisingly, only two respondents in the groups had experienced food poisoning. One attributed it to some tuna mayonnaise they had eaten, the other had suffered from it after not reheating left-over take-away properly.

4.2 Risks associated with storing, preparing and cooking raw chicken

All said they were careful when preparing and handling raw chicken.

Precautions which they claimed to take included:

- Washing hands before and after handling meat to avoid cross-contamination
- Keeping raw and cooked meats separate
- Using separate chopping boards and utensils
- Not re-freezing previously frozen meat
- Cooking frozen meat properly
- Wrapping meat properly when freezing to avoid freezer burn
- Fridge layout – raw meat to be kept at the bottom of the fridge

Undercooked chicken was felt to be the most likely cause of food poisoning.

Respondents identified any “redness”, “pinkness” or “wobbliness” in the meat as posing a risk (especially by the bone) since they felt this demonstrated that the meat was undercooked.

There were very few concerns expressed regarding eating out. It was assumed that restaurants and most chain take-aways were trustworthy in terms of food safety and handling practices. However, the risk of food poisoning was associated with take-away outlets more than restaurants. The appearance of a food establishment was perceived as a key indicator of its level of hygiene: *“If it looks dodgy then you don’t go there...”*

4.3 Awareness of Campylobacter

Only a small number of respondents had heard of Campylobacter:

- One thought she had heard about a case of Campylobacter in Scotland, possibly related to seafood
- One respondent, a chef, had heard about it but didn’t know anything about it
- One was aware that a colleague had had a case of food poisoning, which she thought might have been Campylobacter. It had taken 2-3 weeks to diagnose and she had been ill and off work for a long time.

- One respondent thought Campylobacter was associated with re-heating rice, which he had recently discovered was not advisable, and posed a health risk.

The remainder had never heard of Campylobacter.

When asked how they could reduce the risk of contracting any type of food poisoning in the home, the majority said they would always wash their chicken.

Most (including the chef, when at home) were rinsing their chicken under the cold water tap. Others:

- Washed with salt
- Poured boiling water over the chicken
- "disinfected" the chicken by washing with vinegar
- Washed with salt or lemon juice

Washing meat was felt to be particularly important if there was blood in the meat tray when they bought it.

Only one respondent did not wash her meat. She was from South Africa where meat is often sold from a street stall.

"I don't wash my meat; I come from Africa where we eat Biltong that has been left to hang outside to dry in the open air..."

Respondents that they washing chickens through habit. These habits tended to have been inherited from family members. It was also commented that washing the inside of the chicken was a habit which harked back to when chicken was sold with the giblets inside them. Respondents acknowledged that this practice is no longer necessary given that chickens usually don't come with giblets, or if they do they are wrapped in polythene.

4.4 Reactions to the statistic establishing the risk of contracting Campylobacter

"It is estimated that currently each year in the UK around a million people suffer a foodborne illness, which leads to 20,000 receiving hospital treatment and 500 deaths, at a total annual cost of nearly £1.5 billion. Campylobacter is the biggest cause of foodborne disease in the UK, causing more cases of illness than any other bacteria and causing the most number of deaths after listeria. Recent research has suggested that between 35% and 80% of human campylobacteriosis cases may be attributable to chicken sources."

Respondents were surprised by this statistic. The fact that the incidence of Campylobacter is so high and the number of deaths astonished them, particularly as they had not heard of the disease in the first place. The statistic inspired many questions:

- How does food become contaminated with Campylobacter?
- Where does contamination occur?
- How does Campylobacter get into the food?
- Is Campylobacter present on all chicken including organic and free range chicken?
- Is Campylobacter 'dormant' in the chicken until you cook it?
- Has the incidence of Campylobacter increased because we are eating more processed and prepared chicken?

The wording of the statistic also caused confusion. Where the description referred to 'chicken sources', initially respondents thought it referred to 'sauces'.

Transportation and storage temperature of the chicken was also mentioned as a factor assumed affect contamination levels:

"You don't know what temperature the chicken has been stored at since it's been killed. They have to transport the chicken and how many of us know what temperature our fridges are at home?"

Some felt that the slaughterhouse had a role to play in ensuring that their chickens were 'clean': *"...they should sterilise it and wrap it at source..."*

Most believed that any health risk posed by contamination could be overcome by cooking chicken properly:

"You have to cook the chicken at the right temperature, for the right time to kill the bacteria. It's best that the manufacturer provides a chicken as clean of bacteria as it can be, wrapped and stored correctly – then it's down to the consumer to cook the chicken correctly."

All agreed consumers needed to be educated on how to cook their chicken properly.

4.5 Initial Reactions to decontamination treatments

Initially, the idea of treating raw meat to reduce surface contamination caused concern. Respondents didn't feel it sounded very appetising. They were concerned that decontamination treatments might affect the taste of the chicken since they assumed that any treatment would involve adding chemicals to the meat:

"I'd worry about the long term effect of chemicals on the food, especially on my children. These chemicals can cause cancer and other things we don't know about."

The word 'treatment' was disliked. It reinforced expectations that chemicals would be involved in the treatment:

"We've shifted from processing our food to organic and free range without chemicals and now we are being moved back to having chemicals added to our meat."

"It's the word 'treatment' I don't like. It's gone through a process."

Overall, reactions in the groups were polarised, with some respondents actively disliking the idea of chicken being treated ...

"If there was a chicken saying treated and one saying untreated – I'd take the untreated chicken and cook it thoroughly."

...and others being more accepting of the possibility:

"If I knew that by being treated it would benefit me, then I would choose it."

"Do I need it treated if I am washing my chicken and disinfecting it in vinegar?"

"I wouldn't care as long as it doesn't affect the taste or quality."

Many said they would still want to wash their meat even if it was treated since they would want to wash off any treatment residue before cooking it.

4.6 Lactic Acid Treatment

4.6.1 Initial reactions

"a weak solution of lactic acid is sprayed or misted onto the meat"

Initial reactions to this concept were mixed.

One or two were aware that lactic acid is a natural substance produced in our own bodies. However, the majority had never heard of it.

The word 'acid' was very emotive. It was perceived to infer that the process used chemicals or was very astringent. Overall, it did not sound appealing and respondents were concerned about the effect it might have on their bodies and their health if they ingested it over time:

"We don't know what it is but it sounds controversial. It sounds like a chemical – a cleaner."

The term 'Lactic Solution' was suggested as an alternative descriptor.

Once those aware that lactic acid is a natural substance produced by our bodies informed the rest of the group, all became more accepting of the possibility of the treatment. However, everyone still felt they needed to have more information about it.

Respondents remained unclear how the treatment would be administered. Ideas ranged from a man wearing a sprayer on his back spraying each chicken, through to a spray booth in which the lactic acid would be misted on to the chicken as it passed through.

A few respondents remained unconcerned about this treatment and felt they didn't need to know it was happening:

"Do we really need to know? We have all our fruit and vegetables sprayed anyway so what's the difference? If I'm not going to notice it and it's not going to harm me"

and just stop me from being ill, then why should I worry about it really? Because everything has been sprayed with something hasn't it?"

"Why don't they just go ahead and do it? We wouldn't know anyway."

At this stage, respondents who wanted to know more asked:

- How will the treatment be carried out?
- Will there be any side effects?
- Will it affect the taste, appearance and quality of the meat?
- Will it increase the price of the meat?

This group suggested that an awareness campaign would be necessary to inform people about why their chicken was being treated. Without this, this group felt that people would be put off buying treated chicken as they would not understand why the treatment was necessary.

"It takes more convincing because you are telling us about something you can't see."

One respondent expressed concern as to whether eating treated chicken in the UK would cause problems when visiting a country which didn't treat their chicken. Would it make people more susceptible to infection if they ate untreated chicken?

4.6.2 Acceptability of the Lactic Acid treatment

Respondents were asked to give this treatment a score of between 1 and 5, with 5 being the most acceptable.

Most in both groups gave this treatment a score of 4 or 5. Two respondents in each group have a score of 1 or 2 because they felt they did not have enough information about the treatment and had not known there was a problem in the first place.

One respondent gave a score of 3 because of their concern regarding potential increased susceptibility when travelling abroad.

4.6.3 Facts about Lactic Acid treatment

The facts about the Lactic Acid were read out to the groups one by one.

The European Food Safety Authority has concluded there are no safety concerns with respect to lactic acid treatment, provided food additive specifications are met. Respondents in the C2DE group felt that this did not make them feel any better and they questioned whether it was already been carried out: *"I wouldn't know if they are doing this already"*

Lactic acid treatment is the main decontamination treatment used in the US and in beef it is used to reduce E. coli 0157 contamination: The C2DE group were reassured by this statement. However, they still felt that the risk could be avoided in the first place if the meat is cooked properly.

"That is good, it sounds good. If something is killing E. coli then it has to be good."

"It's good to hear it, but still if you cook it properly then it's not going to be an issue."

ABC1 respondents were more concerned about wanting to know the length of time the treatment has been used in the States and whether any cumulative effects have been found.

Lactic Acid is formed by natural fermentation in products such as cheese, yoghurt, soy sauce, sourdough, meat products and pickles: The ABC1 Group was reassured by this statement: *"Oh well – it's already in our food then. So I couldn't overdose on it?"*

Respondents from the C2DE group were concerned that although lactic acid is naturally present foods such as cheese and yoghurt, it was not naturally present in

meat. One respondent in the group explained, that if a chicken ran from a to b, then it would have a build-up of lactic acid in its muscles naturally.

Despite this information, respondents' opinions remained divided: some felt the meat would be fine to eat; others did not feel that they would want it added to their meat.

Lactic Acid has a natural antimicrobial function which is the basis of the preservation achieved in fermented foods: overall, this was very reassuring as respondents recognised they are already eating lactic acid and therefore felt it was unlikely to harm them.

Lactic Acid is naturally present in human and animal muscle tissue as an energy supply: this statement elicited very little comment from either group other than it was reassuring and reinforced the information they had already been given by other group members.

Although the name suggests it, commercial lactic acid is not derived from milk and therefore allergic reactions are unlikely: there were no respondents in the groups for whom lactose intolerance was an issue, but respondents recognised that it might be of concern to some and that this information would therefore be reassuring for them.

Lactic Acid for commercial use can be produced in a natural manner by the fermentation of beet/cane sugar or glucose, or produced synthetically: all agreed that they would prefer it if lactic acid was produced from natural ingredients, rather than produced synthetically. The word synthetic rang alarm bells:

"I'd prefer it if I knew it was made from the beet/cane sugar as that sounds more natural. I don't like the word synthetic."

Very small quantities of lactic acid are left on the meat when used, much less than the amount present in the foods we eat such as cheese and

yoghurt: After hearing this statement, respondents were much happier with the concept of the lactic acid treatment, to the point where they claimed that they would not need to know about it at all:

"It's starting to look less and less of an issue...really do we need to know?"

It should be noted that this remark was made in the context of a high volume of additional information about lactic acid treatment. By this point, respondents had effectively been reassured about the process.

Preliminary studies in the UK have shown that lactic acid may be effective in reducing Campylobacter contamination in poultry carcasses: This statement caused confusion. The use of the word 'carcass' led respondents to focus on chicken left-overs since the word 'carcass' was associated with bones and the meat left on them:

"We used to boil up the whole carcass as stock etc. Does this mean we shouldn't do that?"

The treatment would not have any direct effect on the taste, texture and look of the meat: Respondents felt this was a very important statement to make:

"It is very important that the treatment does not affect either taste, texture, the look or the quality of the meat. It's best you don't notice that it has been treated at all."

"This is very important. I would not be interested in the treatment if it altered the quality of the meat."

Having heard all the information, most felt they would be quite happy for chicken to be treated. However, one or two claimed they would continue to wash their chicken.

Everyone agreed that if the taste, texture or quality of the meat was affected in any way they would not be interested in buying treated chicken it even if it reduced the levels of campylobacter contamination.

4.6.4 Labelling

Nearly all agreed that consumers would need to be informed about the treatment on the food label. This is a typical consumer reaction since labelling is perceived to be a central feature of the 'food safety information structure'¹⁰, as detailed in the literature review that forms part of the scoping stage of this project. The ABC1 group therefore felt that the label would need to detail:

- The nature of the treatment
- Why the meat has been treated
- And that cooking properly is ultimately the thing that will kill bacteria

One respondent disagreed:

"Sometimes you can know too much. They wouldn't be doing this treatment if it wasn't needed and it wasn't safe. You would need to trust the food standards people that they wouldn't let them do it if it was harmful."

The C2DE group felt that, in reality, very few people would read the label.

This view echoes the findings from the literature review. About 50% of UK consumers self-report that they pay attention to food labelling when shopping (this figure varies across studies to some extent). Those consumers who look at labelling tend to look for food origin (as mentioned elsewhere in this review, food origin is clearly a barometer of food safety) and food safety. Consumers appear more likely to act on food safety labelling where it relates to point of origin and ingredients (this

¹⁰ Taylor M R, Batz M B (2008) 'Harnessing Knowledge to Ensure Food Safety: opportunities to Improve the Nation's Food Safety Information Infrastructure', Food Safety Research Consortium, FSRC report January 2008

presumably implies purchase decisions) than guidance on food handling in the home (which would imply changes in domestic behaviour).

Having a symbol similar to the Farm Assured red tractor or the traffic light system to show that it was approved by the FSA or the health department was thought to be important as it would provide reassurance for consumers regarding the safety of the treatment:

"If the meat had a sticker saying FSA approved like the red tractor, the accreditation would give you the confidence."

"As a government body I would trust them to go ahead with it. You know it's for our benefit, it's not a money making thing...It would be regulated and monitored."

4.6.5 Reactions to a potential price increase

Overall, providing any price increase is only in the region of a few pence, respondents felt that they would be prepared to pay a little extra. Indeed they felt they would be unlikely to notice any increase, since prices were perceived to increase all the time.

Respondents expected that if the lactic acid treatment was put in place, consumers would be unlikely to have a choice between buying treated or untreated chicken. It was assumed that if chickens were going to be treated, all chickens would be treated. Indeed it was suggested that having a choice could reduce the credibility of the treatment.

4.7 Reactions to other treatments

4.7.1 Rapid surface heat treatments

"The meat passes through a hot water bath or is exposed to steam in a chamber or tunnel."

The concern with this treatment was that a heat treatment may 'part cook' the chicken which would make it unsafe to eat. The idea of 'steaming' the meat seemed to be very severe and there was an expectation that this treatment would 'poach' the meat:

"You've rapidly heated the meat then cooled it and then packaged it...it's all too risky."

It was also expected that this process would change the appearance of the chicken. Since there was an expectation that it would be partly cooked, it was assumed that the meat would look white:

"I can see the logic. If you go to a Turkish bath then it cleans your pores and cleanses you, but you come out all wrinkly and I don't want wrinkly chicken."

The knowledge that this treatment was about 'heating' raised the question that if heat treatment works, why are consumers not just told to pour boiling water on the surface of the chicken?

Due to concerns about 'part cooking' the chicken, this treatment was rated only rated 1-2 on the acceptability scale.

4.7.2 Reactions to Rapid Surface Chilling

"The surface of the meat is exposed to a rapid reduction in temperature for a short period."

No matter how many times the concept for this treatment was read, respondents assumed that this treatment would freeze the meat.

Respondents discussed how vegetables were flash frozen to retain their freshness. Some felt that freezing was acceptable, given that they would probably be freezing the chicken anyway. However, concerns were raised as to whether bacteria would

be 'revived' after laying dormant when the chicken thawed out. This concern was based on the assumption that the treatment would freeze chickens.

When told this treatment would not freeze the meat but simply chill it down quickly, respondents were concerned as to whether they could be confident the chicken would then be stored at a constant temperature until it reached the consumer. They also wondered whether the treatment would remain effective once the temperature rose.

On the acceptability scale, the C2DE group and two of the ABC1 group gave this a score of 4.5. They felt that chilling was a more natural process since it did not involve 'adding' anything to the chicken. The rest of the ABC1 group gave this a score of 1.5 due to the doubt they felt about being able to keep the chicken at a constant temperature.

4.7.2 Reactions to Ozone

"The meat is exposed to ozone gas, or dipped into or sprayed with water containing ozone or packed with dry ice pellets that release ozone over time."

Respondents were totally confused by this concept and could not understand how ozone could help reduce bacteria. Their only point of reference for ozone was with regard to the damage to the ozone layer. Indeed one respondent commented that the treatment sounded as if it would be detrimental to the ozone layer.

Both groups felt unable to give this concept a score on the acceptability scale. They all agreed they would need to know much more about this process before they could comment:

"We need a lot more education to understand this one. I just cannot start to understand it."

5. Conclusions

- **There is likely to be little or no recognition of the term 'campylobacter'.** Respondents were familiar with the effects of bacteria i.e. the symptoms of food poisoning, rather than the bacteria themselves.
- **There was an understanding of the symptoms of food poisoning, but little awareness of prevalence or severity.** Respondents therefore had little awareness of the problem that the treatment is attempting to solve. To make a judgement about acceptability, arguably respondents should be made aware of the risks the treatment is designed to avert.
- **The survey must keep respondents minds focussed on raw chicken.** Since consumers eat chicken in a wide variety of formats, they can become distracted into focussing on other chicken products e.g. misinterpreting 'chicken sources' as 'chicken sauces'. In another recent project we discovered that respondents less likely to buy or cook raw chickens answered our questions whilst thinking about cooked chickens (the format in which they were most likely to eat chicken).
- **Words used in the meat industry were not well understood.** For example, the phrase 'meat products' was not felt to refer to raw meat. The word 'carcass' was presumed to refer to cooked leftovers, confused and therefore should be avoided.
- **The word 'treatment' had immediately negative associations with chemicals, as did the word 'acid', 'synthetic' and even 'process'.** All these words had an emotive effect on the audience. It should be noted that very few respondents engaged with any of these words on a rational basis.
- **Although a factually accurate description of the process, the description 'lactic acid treatment' it is likely to be perceived negatively.** The qualitative findings demonstrate that it is possible to modify initially negative reactions to the *sound* of the treatment, by providing factual information that describes the treatment in more detail.

- **The word 'natural' had a powerful effect on perceptions of the treatment.** When describing the treatment in more detail, it should be recognised that the use of this word has the ability to transform perceptions of the treatment.
- **Decisions about the acceptability of the treatment will also be influenced by information describing the ways in which the treatment may/may not affect the taste/texture of the meat.** This information will be key to an accurate assessment of acceptability.
- **Overall, it proved easy to reassure respondents** with a combination of facts about 'naturalness', not affecting taste/texture and leaving little residue on the meat. The survey could be perceived to be biasing opinion if too much reassurance is provided.

- **The acceptability of lactic acid treatment varied depending on existing knowledge of lactic acid being a natural substance.** Previous awareness of lactic acid could be considered as a variable to be captured and used for analysis purposes.
- **The qualitative findings suggest that it is likely that respondents have little scope to *actively* misinterpret the way the treatment works.** This became apparent when discussing rapid 'heating' and 'chilling' treatments which proved far more problematic since they were perceived to conflict with existing food safety knowledge about keeping temperature consistent.
- **A demand for information formed part of the reaction to an unknown treatment.** When asking respondents about labelling information, consider distinguishing between 'social responses' (i.e. altruistic views that food products should be labelled) and 'personal responses' (i.e. would you use this information?)

CAMPYLOBACTER FOCUS GROUPS TOPIC GUIDE

AIM: citizens' forums have demonstrated the way in which the survey describes processing interventions is likely to affect reactions to the processes themselves. The focus group discussions will help us achieve an understanding of how different content and language are likely to affect responses to survey questions about different decontamination treatments.

OBJECTIVES: The discussion will focus on exploring how processing interventions should be described and whether – and if so, what - additional information will be required to support survey respondents' answers.

1. Introduction and explanations (5 minutes)

- Introduce self and Research Works Limited, an independent market research agency
- Explain that we are going to be discussing potential changes to the way in which our meat could be produced in future
- Explain confidentiality (DPA and MRS code of conduct)
- Ask permission to record the session
- The respondent has the right to withdraw from the project at any time

2. Respondent introductions (5 minutes)

- Introduce self, employment, family situation
- What is your role in shopping for your household?
- What is your role in cooking for your household?

- How often do you prepare and eat meat in your household?

3. Understanding of Campylobacter (10 minutes)

- What risks do you associate with storing, preparing and cooking raw chicken?

Probe: temperature storage, cross contamination, under cooking meat.

Moderator to list on flip chart and probe answers: (look for food poisoning).

- Probe for each risk named: how did you become aware of this risk?
- What types of food poisoning are you aware of?
- If not already mentioned: have you heard about Campylobacter?
- If so, what do you know about Campylobacter? From where did you get this knowledge?

Probe: how much of a risk is Campylobacter? How common, how severe?

Probe: what risks does Campylobacter pose?

Probe: what factors might increase or decrease one's risk of contracting campylobacter?

Probe: role of washing chicken if not mentioned.

- How can you decrease the risk of contracting Campylobacter food poisoning – In the home and – when eating out.

4. Initial reactions to decontamination treatments (10 minutes)

Explain that we will be discussing a number of treatments that could be used within the processing plant / slaughterhouse, to reduce Campylobacter on raw meat in the future, specifically poultry and beef.

- Initial reactions to the idea of treating raw meat to reduce surface Contamination
- What are the perceived benefits?
- Are there any concerns? If so, what are they?
- Show respondents statistic establishing risk of contracting Campylobacter:

"It is estimated that currently each year in the UK around a million people suffer a foodborne illness, which leads to 20,000 receiving hospital treatment and 500 deaths, at a total annual cost of nearly £1.5 billion. Campylobacter is the biggest cause of foodborne disease in the UK, causing more cases of illness than any other bacteria and causing the most number of deaths after listeria. Recent research has suggested that between 35% and 80% of human campylobacteriosis cases may be attributable to chicken sources."

- Reactions to the risks stated
- How, if at all, does this information affect your views about treatment raw meat to reduce surface contamination?

Explain that we will now be moving on to discuss four specific treatments that could be used on raw meat in future.

5. Reactions to treatment 1: lactic acid treatments (25 minutes)

- Describe treatment: *"a weak solution of lactic acid is sprayed or misted onto the meat"*

- **Accessibility:** is it clear what this treatment involves?
- If not, what needs to be clarified?
- How, if at all, does the language need to be changed so that most people would be able to understand it?

- **Level of information required:** do you have any questions about this treatment? If so, what?
- What additional information do you need to know in order to make a decision about whether you would eat meat treated in this way?

- **Acceptability:** how acceptable is this treatment? (Use a scale of 1 – 5, from totally unacceptable to totally acceptable)
- Do any of the following factors influence your views about the acceptability of this treatment? (Re-assess position on the scale after each)
 - *The European Food Safety Authority have concluded there are no safety concerns with respect to lactic acid treatment, provided food additive specifications are met*

- *Lactic acid treatment is the main decontamination treatment used in the US and in beef it is used to reduce E.coli 0157 contamination*
- *Lactic acid is formed by natural fermentation in products such as cheese, yoghurt, soy sauce, sourdough, meat products and pickled vegetables.*
- *Lactic acid has a natural antimicrobial function which is the basis of the preservation achieved in fermented foods*
- *Lactic acid is naturally present in human and animal muscle tissue as an energy supply*
- *Although the name suggests it, commercial lactic acid is not derived from milk and allergic reactions are therefore unlikely*
- *Lactic acid for commercial use can be produced in a natural manner by the fermentation of beet/cane sugar or glucose, or produced synthetically.*
- *Very small quantities of lactic acid are left on the meat when used, much less than the amount present in the foods that we eat such as yogurt or cheese.*
- *Preliminary studies in the UK have shown that lactic acid may be effective in reducing Campylobacter contamination on poultry carcasses*
- The treatment would not have any direct effect on the taste, texture and look of the meat. How important is it that these qualities are not compromised with any treatments to your meat? If the treatments were to effect taste, texture and look of the meat but would remove the bacteria – would this still appeal to you?
- Given this information now- would you expect to see information about lactic acid on the labels of the meat you may purchase?
- What type of labelling would you expect? Would the type of labelling make the treatment more acceptable to you?

There may be additional costs to the consumer with use of any decontamination treatment. For lactic acid it may be in the region of a few pence per product.

- **Overall**, if you were being asked to make a decision about whether you would want to eat meat that had been treated with lactic acid, what are the key pieces of information that would inform your decision?

6. Reactions to treatment 2: rapid surface heat treatments

(10 minutes)

- Describe treatment : *"The meat passes through a hot water bath or is exposed to steam in a chamber or tunnel."*

7. Reactions to treatment 3: rapid surface chilling treatments

(10 minutes)

- Describe treatment: *"The surface of the meat is exposed to a rapid reduction in temperature for a short period."*

8. Reactions to treatment 4: ozone (10 minutes)

- *Describe treatment: "The meat is exposed to ozone gas, or dipped into or sprayed with water containing ozone or packed with dry ice pellets that release ozone over time."*

Ask for sections 6, 7 and 8:

- **Accessibility:** is it clear what this treatment involves?
- If not, what needs to be clarified?
- How, if at all, does the language need to be changed so that most people would be able to understand it?
- **Level of information required:** do you have any questions about this treatment? If so, what?
- What additional information do you need to know in order to make a decision about whether you would eat meat treated in this way?
- **Acceptability:** how acceptable is this treatment? (Use a scale of 1 – 5, from totally unacceptable to totally acceptable)
- TBC: Do any of the following factors influence your views about the acceptability of this treatment? (Re-assess position on the scale after each new piece of information is delivered) To include:
 - Any information that might address perceived safety concerns
 - Any information about 'natural' origins (e.g. ozone)
 - Any information about potential benefits of treatment
 - Any information how meat may/may not be affected by treatment
 - Cost implications

9. Summing up

- Knowing what we know now about all four of these treatments, where would you plot each on the acceptability scale?

- What are the key reasons some treatments are more and less acceptable than others?



APPENDIX C
SURVEY METHODOLOGY

1 Sampling

The sample was a two-stage random probability sample. The target achieved sample size was 2,000, chosen to yield robust results with low confidence intervals, and to allow detailed analysis by-groups. The issued sample size was calculated on the basis of an assumption that 7% of issued addresses would prove to be ineligible (vacant, demolished, non-residential etc) and that it would be possible to conduct interviews at 55% of eligible addresses. This response estimate was based on recent experience of other government surveys, taking interview length into account. In order to allow analysis by the four separate countries of the UK, the sample in Scotland, Wales and Northern Ireland was boosted with the aim of achieving 250 interviews in each, to permit at least rudimentary analysis by country.

1.1 Sampling Points

Census Super Output Areas (SOAs) were used as the sampling points. SOAs have generally replaced Postcode Sectors as sampling points in probability surveys, and are aggregations of census Output Areas, created after the 2011 census. In this case, Lower Level SOAs (LSOAs) were used. There are 41,283 LSOAs in the UK altogether, though, as is often the case on UK-wide surveys, those in Scotland north of the Caledonian Canal were excluded from the sample.

A nationally representative sample of 100 LSOAs was drawn across the whole of the UK. This is a smaller than average number for a sample size of 2,000, but it was constrained by the relatively short interview length and the need to give interviewers a large enough allocation of addresses to be able to work efficiently, especially in terms of making a large number of calls at addresses where no contact has been made. Because sampling error is affected by the clustering of the sample this will have had some impact on efficiency, but only to that extent that people in each sampling point have similar views about decontamination treatments.

Almost all probability samples involve stratification, or sorting, of the sampling points as part of the sample selection process. Sorting the LSOAs by a number of stratification variables ensured that, on those variables at least, the issued sampling points were fully representative of the country as a whole. With a non-stratified

sample there is a chance – admittedly a very small one – that all the sampling points would be in England and none in the other countries. More realistically, a non-stratified sample could over or underestimate one country relative to another. Stratifying prevented this.

Rather than stratifying just by country the sample was, as is standard practice, stratified first by Government Office Region. Stratification variables other than region differ more from survey to survey, as used GfK NOP's standard 4-cell urban/rural classification, since those closer to farming may feel differently, This classification is:

- Metropolitan (the former metropolitan counties)
- Urban (all areas, other than above, with a population density of 7 or more persons per hectare)
- Mixed urban/rural (areas with a population density of greater than 1.5 and less than 7 persons per hectare)
- Rural (areas with a population density of less than 1.5 persons per hectare)

In theory this stratification would result in 48 strata (12 countries/regions by 4 urban/rural types) but in practice not all of these cells exist. There are no metropolitan areas in several regions, for example, and the London region is, by definition, all metropolitan.

Finally, most surveys stratify by some measure of affluence/deprivation, and in this case the variable used was the percentage of heads of households in non-manual occupations, as was used on the FSA's Food and You survey. This stratification ensured that the issued sample covered all regions of the country and levels of urbanisation, and finally that it had the correct proportion of better-off and less well-off areas.

Census 2001 data was used for the stratification. This resulted in a list of LSOAs broken down into the strata above, and each sorted by the proportion of non-manual households, with a population figure for each one. As is done on all probability samples, selection of the actual sampling points for the survey were cumulated down the entire list, and the overall total divided by 100 (the number of points required). This gave a sampling interval, which was then repeatedly applied down the

cumulated population totals after a random start point, to identify the 100 sampled points. This ensured that each stratum was covered in the survey in proportion to its population.

Using the same stratification and process, four additional sampling points were sampled in Scotland, seven in Wales and ten in Northern Ireland, to produce the boost sample referred to above.

As is discussed in section 2 below, additional sample had to be drawn to boost the number of interviews achieved, and an additional 25 points were drawn. The additional points were allocated across the regions in the stratification according to the shortage of interviews per region compared with expectations, and 40 addresses were issued in each.

1.2 Sampling addresses

Based on the response rate assumptions above, and allowing a small safety margin, 40 addresses were issued in each main sample point. Since it is impossible to guarantee any particular response rate, or indeed to predict one with a great degree of accuracy, it is normal practice to draw some reserve sample in case response is lower than anticipated. In this case three additional addresses were drawn, which would yield 2,000 interviews even if response dropped to 50%. The sampled SOAs were then matched to postcodes, using centroid grid references. In each of the 100 main sample points, 43 addresses were sampled by dividing the total number of delivery points in the relevant postcodes by 43 to produce a sampling interval, which was then repeatedly applied from a random start point.

For the boost samples, 40+3 addresses were drawn in each point in Scotland and Northern Ireland, but because the required Welsh boost sample was not divisible by 20 (the average target per point overall) 43 plus 3 were drawn in the Welsh boost points.

1.3 Sampling individuals

Because delivery points do not always contain only one dwelling, and because dwellings do not always contain only one household, interviewers if necessary performed a selection process at the address, using a randomised selection process known as a Kish grid to select one dwelling and/or one household.

There was discussion over whether individuals within selected households should be selected for interview, again using a Kish grid, in which case the survey would represent all adults, or whether the risk of people who are little involved in shopping or cooking giving “don’t know” responses to a lot of the questions would make a sample of cooks/shoppers more appropriate.

It was originally decided that the sample should be one of all adults, but then during the pilot some interviewers reported that people who never bought nor cooked meat found the questions completely irrelevant to them. A late decision was therefore made to add a filter question to establish how many people there were in the household who ever bought or cooked or ate meat , and to conduct a random sampling among those people.

2 Fieldwork

114 interviewers worked on the survey, all were members of GfK NOP’s trained interviewer panel. They were briefed by means of detailed written instructions.

Fieldwork began on 18 June and was scheduled to finish on 31 July. However progress in field was slower than anticipated, and the fieldwork period had to be extended. Furthermore, the number of interviews was lower than estimated. This was in part because of the late decision to exclude those who never buy or cook meat from the sample. Households in which no-one bought or cooked meat were thus excluded from the survey. In the absence of any reliable information it was not possible to make any estimate of the impact of this decision.

The problem was exacerbated by the fact that response rates were also considerably lower than estimated, and the survey proved a much more difficult “sell” on the doorstep than expected.

A decision was therefore taken to draw an additional sample to boost the number of interviews above 2,000, and 25 points were issued as described above. Fieldwork on the new sample continued until 27 September 2012.

In accordance with MRQSA rules and standard GfK NOP practice, 10% of interviews were back-checked by a specialist team to ensure that the interview had taken place, had taken about the right length, and that the correct answers had been recorded to a small number of key questions. In addition, interviewers who had not been accompanied during the previous six months were accompanied by a member of Field management for some of their interviews. No serious problems were revealed as a result of this process.

2.1 Response rates

The figures below show response rates from the original and additional samples combined.

Issued sample	5859
Vacant	303
Demolished/no trace	75
Non-residential	48
Institution	12
Total deadwood	438 (7%)
Residential addresses	5421
Refused screener	891
No contact at address	489
Unable to complete screener	51
Incomplete	165
Total unknown eligibility	1696
Screener completed	3825
Interview	2110
No-one eligible	261
Refusal by selected person	567
Proxy refusal selected person	133
No contact selected person	545
Selected person too elderly/ill	85
Selected person away	63
Selected person no English	12
Other no interview	49
Total selected no interview`	1454

In calculating a response rate (according to AAPOR Standard response rate 3) an estimate is needed of the proportion of cases of unknown eligibility that would have proved ineligible had interviewers managed to conduct a screening interview there. Since 7% of those households that were screened had no eligible adult, it must be assumed that 7% of the non-screened households would have done so as well.

Thus the 1696 cases of unknown eligibility were split into 119 ineligible and 1577 eligible.

This in turn means that the total of eligible households is 5041, and so the 2110 interviews conducted represent an overall AAPOR3 response rate of 42%.

As stated in Section 3 of the main report, the total number of interviews actually processed was 2,078 rather than the 2,110 according to the Electronic Sample Management Information (ESMS) completed by the interviewers each day that they work. It is almost inevitable on a CAPI survey that some completed interviews are lost in the process of transmission from the interviewers' CAPI machines to the head office servers where the data are processed. This is the modern equivalent of questionnaires that used to get lost in the post in the days of pen and paper interviews.

Because of the risk of transmission failure back-up copies of interviews are kept on the CAPI terminal, but in some circumstances it is impossible to restore the archived local copy, and the interview is lost. It is usually possible to restore most missing cases in this way, but on this particular survey a combination of circumstances meant the number lost was higher than usual, at 32, which represents 1.5% of all completed interviews.

There were a number of software communication problems, associated with the use of an updated version of the software, which led to a lot of interviews failing to upload during communication between the interviewers' CAPI machines and the central servers, without this being flagged as a problem. Once processing of the data began this discrepancy became apparent, and the standard retrieval process was activated. Unfortunately several interviewer machines had been sent back to head office for a software upgrade and because there had been no indication of any missing data, the machines were wiped clean as part of this install, and the data were lost.

3 Analysis

3.1 Weighting

Survey samples are normally weighted for one of two reasons – to correct for any individuals or cells that had a greater or lesser than average chance of being selected, or to correct for any imbalances in the achieved sample when compared with known population estimates.

In this case the initial sample was representative of all of the different cells of the stratification, so no weighting was necessary for this. The additional sample was not similarly representative, but since it was drawn in such a way as to make up for the areas of greatest under-achievement of interviews it could be argued that this merely made post-stratification weighting less necessary.

The sample as drawn was representative of all addresses in the UK, and each address (or more technically delivery point) had an equal chance of selection. Since one person was selected at each address for interview, this means that an address with ten people has exactly the same chance of being selected as an address with only one person. But once the addresses have been selected, the person in a one-person address is bound to be chosen for interview, whereas each person in the ten-person address has only a one in ten chance of being selected. This in turn means that the sample is biased in favour of people who live in small households, and against people who live in large ones, and weighting is needed to correct for this.

There are actually three separate stages at which selection probabilities can occur. The first is that the delivery point on PAF may in fact be a building that contains a number of separate dwellings (typically flats) and the interviewer has to select one of the dwellings for interview. Then a dwelling may contain more than one household – a household being defined as people who share a living room or who have common catering for at least one meal a day – and again one of these households has to be selected. Finally, within each household one person has to be selected for interview.

This means that to calculate a person's chance of being interviewed the number of dwellings at the delivery point has to be multiplied by the number of households within the selected dwelling, by the number of adults in the selected household. The

probability of selection is the inverse of this number, and so to correct for it to the required weight is simply the result of the multiplication.

Any form of weighting has a negative effect on the reliability of the data, as it reduces the effective sample size and thus increases sampling error. The impact of weighting on effective sample size is mainly determined by the extreme high and low weights, and the number of respondents who receive those weights.

In the case of selection weighting, the multiplication of three selection factors described above can lead to very large weights indeed. A tenement building that contained 10 flats, and where the selected flat contained a single household of four adults would result in a selection weight of $10 \times 1 \times 4 = 40$.

To minimise the effect of weighting on effective sample size it is standard practice to “cap” selection weights at an agreed level, so that all respondents whose weight should in theory be above the cap level receive instead a weight of the cap level itself.

Based on standard practice, selection weights were capped at 5.

Corrective weighting for any of the imbalances that often occur (such as a greater tendency for women to be interviewed than men) could not be used in this survey because of the decision to exclude those who never buy or cook meat. There are no reliable population estimates for this group, and so although the sample is indeed more female than the population at large, there was no basis for applying correction factors. There is little reliable information on the vegetarian population, but in any case the survey base would exclude more “traditional” men who ate meat but were entirely uninvolved in the purchase or cooking of it.

No corrective weighting was therefore applied, but it is worth noting that, as is discussed in detail in section 4.5.1, the statements that were used in this survey and also in the Food and You survey¹¹ produced almost identical results in the two surveys.

¹¹ http://www.foodbase.org.uk/results.php?f_category_id=&f_report_id=641

This implies that weighting is not essential, and also that the low response rate on this study does not seem to have harmed the quality of the data.

3.2 Analysis

A standard set of cross-analysis variables were agreed, including demographic, behavioural and attitudinal variables, and all questions were analysed by this standard set of variables. In addition to this cross-analysis, CHAID analysis was performed on some key variables. Further information is contained in Appendix E, and the full set of cross-analysis variables can be seen in the computer tables published on foodbase with this report <http://foodbase.org.uk/>

The Quantum computer tabulation software used for the tabulations contains built-in z-tests to calculate standard errors, and highlights differences that are significant at the 95% confidence level. These are based on effective sample size after weighting.



APPENDIX D
THE QUESTIONNAIRE

INTRODUCTION

I'd like to start with some questions about your attitudes to food in general

1.1 Here are some statements people have made about food. Can you tell me to what extent you agree or disagree with them?

SHOWCARD A, SINGLE CODE

RANDOMISE STATEMENTS

SCALE

Definitely agree

Tend to agree

Neither agree nor disagree

Tend to disagree

Definitely disagree

(Don't know) **CODE NOT SHOWN**

STATEMENTS

The experts contradict each other over what foods are good or bad for you

What you eat makes a big difference to how healthy you are

When preparing food for myself I could be more careful about hygiene

For me, most of the time food should be as quick as possible to prepare

I am unlikely to get food poisoning from food prepared in my own home

It's just bad luck if you get food poisoning

People worry too much about getting food poisoning

You only get food poisoning if you don't cook food properly

People only get food poisoning at home if they buy food that's already bad

1.2 Are you the person who usually does most of the cooking in this household, or do you just do some of the cooking, or do you not usually do any cooking at all?

Does most or all of the cooking

Does some cooking

Does no cooking

1.3 And do you usually do most of the food shopping, or some of it, or do you not usually do any of the food shopping?

Most or all of the food shopping

Some of the food shopping

No food shopping

1.4 How often does anyone in your household cook any kind of raw chicken, including chicken fillets or things like chicken Kiev? Would it be READ OUT

1.6 And how often does anyone in your household cook any kind of raw beef, including beef burgers or mince? Would it be READ OUT

Most days

At least once a week

At least once a fortnight

At least once a month

Less than once a month

Never

FOOD POISONING

2.1 Have you personally ever had food poisoning?

SINGLE CODE, SHOW CARD B

Yes more than once

Yes once

I think so but I'm not sure it was food poisoning

No

DK (CODE NOT SHOWN)

2.2 You can get food poisoning if food is not stored, prepared or cooked properly. When you buy raw food to prepare and cook at home are some foods more likely to give you food poisoning than others?

IF YES Which? Any others?

INTERVIEWER NOTE, if respondent says it depends how it is stored prepared or cooked, explain that we want to know if they store prepare or cook all foods the same way, are some more likely to give them food poisoning.

Meat

Chicken

Turkey

Pork/bacon/ham

Beef

Lamb

Duck

Any other specific meat

Meat in general

Seafood/Shellfish

Prawns/shrimps

Mussels

Oysters

Any other specific seafood/shellfish

Seafood/shellfish in general

Fish

Any specific kind of fish

Fish in general

Dairy

Milk

Cheese

Butter

Other dairy

Other

Rice

Vegetables and fruit

Any other food mentioned

Yes, but don't know which foods

No

Don't know

TREATMENT OF RAW MEAT

INTERVIEWER NOTE: IDEALLY WE WOULD LIKE YOU TO READ THE WORDS OUT LOUD WHILST RESPONDENTS READ THEM ON THE SHOWCARD, AS THIS HELPS THEM TAKE IT ALL IN. BUT IF THEY INSIST THEY WOULD RATHER READ IT ON THEIR OWN, LET THEM

SHOWCARD C AND READ OUT One of the main causes of food poisoning is bacteria on raw meat. Thorough cooking in the home can get rid of these bacteria on the meat, but bacteria can still spread to other foods during food preparation. This cross-contamination in the home can lead to food poisoning. The risk of food poisoning would be less if the bacteria could be mostly destroyed **BEFORE** the meat went on sale. It is possible to remove most of the bacteria on raw meat by treating it when the meat it is being cut up in the slaughterhouse before being sent to butchers and supermarkets.

INTERVIEWER NOTE: If respondents ask, tell them that at present the only thing that can be done in the slaughterhouse is to wash the meat in water

SHOWCARD D There are a number of different treatments that could be introduced for use in the slaughterhouse, and they are listed on this card. **READ OUT EACH IN TURN**

INTERVIEWER NOTE If respondent raises concern about lactic acid and lactose/dairy intolerance explain that this treatment does not involve milk in any way and there is no risk for anyone lactose/dairy intolerant. If respondent asks if treatments are currently used explain that at present the only thing that can be done is to wash the meat in water in the slaughterhouse. **NONE of these treatments are currently in use in the UK** but could be introduced,

The meat is sprayed or misted with a weak solution of lactic acid;

The meat passes through a hot water bath or is exposed to steam in a chamber or tunnel;

The meat is exposed to ozone gas;

The surface of the meat is exposed to a rapid reduction in temperature for a short period

3.1 SHOWCARD E I am going to give you more detail shortly on these treatments, but first I'd like to get your immediate reaction to them, based on what I've just said about them. For each of these treatments, can you tell me how acceptable or unacceptable you think it would be to treat meat in this way to reduce the risk of food poisoning. Firstly, lactic acid treatment? **ASK ABOUT EACH IN TURN**

Definitely acceptable

Acceptable

I have no feelings either way

Unacceptable

Definitely unacceptable

(It depends)

Don't know

CAPI – 3.2-3.4 should now NOT be rotated

I am now going to give you some more information about lactic acid treatment, and then ask for your views again. This isn't currently used to treat meat in the UK but could be in the future. Lactic acid treatment of raw meat has been assessed and ruled to be safe.

3.2. SHOWCARD F The treatment involves spraying the raw meat with lactic acid in the slaughterhouse. Lactic acid is a naturally occurring substance present in human and animal muscles. It is also present naturally in foods such as cheese, yogurt and soy sauce. Now you

know this, how acceptable or unacceptable do you think it would be to treat meat in this way to reduce the risk of food poisoning

3.3 SHOWCARD G The treatment involves spraying the raw meat surface with a fine mist of a solution of lactic acid. Only very small amounts are left on the surface of the meat after treatment, less than the amount that is present naturally in the meat before any treatment.. Now you know this, how acceptable or unacceptable do you think it would be to treat meat in this way to reduce the risk of food poisoning

3.4 SHOWCARD H Meat that has been treated with lactic acid in this way does not look or taste different from untreated meat. Now you know this, how acceptable or unacceptable do you think it would be to treat meat in this way to reduce the risk of food poisoning

Definitely acceptable
 Acceptable
 I have no feelings either way
 Unacceptable
 Definitely unacceptable
 (It depends)
 Don't know

3.5 INTERVIEWER CODE Did the respondent seem to you to be considering the extra information at 3.2 – 3.4 or do you think he/she already made his/her mind up and wasn't going to think about changing his/her opinion?

Considered information
 Already made mind up

3.6 Is there any other information about lactic acid treatment that would be useful to you in deciding whether it is acceptable or not? IF YES What information is that?

No
 Yes, but don't know what
 Yes, and does know what– WRITE IN

CAPI – RANDOMISE ORDER OF beef and chicken

3.7SHOWCARD J Some types of meat are more likely to cause food poisoning than others. The main food types associated with food poisoning in the UK include red meat and chicken. Thinking first about {chicken/beef}, how strongly would you support or oppose the use of lactic acid treatment on raw {chicken/beef}?

And how strongly would you support or oppose the use of lactic acid treatment on raw {chicken/beef}?

Strongly support
 Support
 Neither support nor oppose
 Oppose
 Strongly oppose
 (It depends)
 Don't know

3. 8 Suppose you were buying chicken in a shop and were offered a choice between raw chicken that had been treated with lactic acid, and had a lower risk of food poisoning, and raw chicken that had just been washed in water. Which do you think you would buy?

Buy treated
Buy untreated
Not sure

LABELLING

4.1 As well as labels saying what the product is, and the price, and any special offer labels, packs of meat in shops often have labels with other information. When buying raw meat in the supermarket how often do you look at these other labels?

INTERVIEWER NOTE – If respondent only buys meat from butcher/butcher's counter, code "Not applicable"

Always
Usually
Sometimes
Or never
Not applicable/no labels

IF NEVER GO TO 4.3 ELSE ASK 4.2

4.2 What sorts of things are you usually looking for on the labels? Any others?

For best before dates
For ingredients
For nutritional value
To see where it's come from
To see if it's organic
To see if it's free range/barn
To see if it is whole meat/recovered meat
Any other reason

4.3 SHOWCARD K If the lactic acid treatment we have just been talking about is used by some meat suppliers to reduce the risk of food poisoning from their meat, how important or unimportant do you think it is that this should be labelled on the packaging?

Very important
Fairly important
Not very important
Not at all important

4.4 SHOWCARD L There are a number of reasons why some people think it isn't necessary to label raw meat to show it has been treated with lactic acid. After hearing each one can you say from this card how convincing or unconvincing you think it is

- a) there is no need for labelling because the treatment is of no safety concern
- b) there is no need for labelling because there is already lactic acid in meat, you can't differentiate between lactic acid added in the treatment and the lactic acid that is already naturally present in the meat,
- c) there is no need for labelling because there is no legal requirement to have labels for lactic acid treatment, e.g. as it does not cause allergic reactions in people

Very convincing
Fairly convincing
Not very convincing
Not convincing at all

Not sure

4.5 SHOWCARD M On this card are four possible ways that packs of raw meat could be labelled to show that it had been treated with lactic acid. Can you say which of them you think is best, in terms of containing about the right amount of information.

- a) The label read “this meat has been treated to reduce the risk of food poisoning”
- b) The label read “this meat has been sprayed with lactic acid to reduce the risk of food poisoning”
- c) The label read “this meat has been treated with lactic acid to reduce the risk of food poisoning. The taste and texture of the meat are not affected”
- d) The label read “this meat has been treated with lactic acid to reduce the risk of food poisoning. The taste and texture of the meat are not affected, and there is no more lactic acid present than occurs naturally in meat”

- A
- B
- C
- D
- None of them
- Don't know

4.6 If labelling was introduced to show that meat had been treated with lactic acid, which of these types of product do you think should be labelled? The labels might be on the food itself, or displayed in the café or restaurant **READ OUT EACH IN TURN**

Packs of chicken joints
Chicken nuggets
Rotisserie roasted whole chickens
Pizzas that contained chicken
Beef in a burger from a fast food outlet
Chicken salad in a salad bar

Yes
No
Don't know

4.7 I'm now going to ask you some questions about one of the other possible treatments – rapid chilling. This treatment involves exposing the surface of the meat to a rapid reduction in temperature during the chilling process for a very short period. This treatment is most likely to be used on chicken. The surface of the skin may freeze momentarily but the flesh is not frozen.

INTERVIEWER – If necessary explain how surface only can be frozen

SHOWCARD N Now you know this how acceptable do you find the treatment for reducing the risk of food poisoning?

Definitely acceptable
Acceptable

I have no feelings either way
Unacceptable
Definitely unacceptable
(It depends)
Don't know

4.8 The rapid chilling process kills some of the bacteria that cause the majority of food poisoning in the UK, these bacteria would not come alive again when the temperature was raised. Meat treated in this way can safely be frozen and defrosted without the bacteria coming alive again.

SHOWCARD O Now you know this how acceptable do you find the treatment for reducing the risk of food poisoning?

Definitely acceptable
Acceptable
I have no feelings either way
Unacceptable
Definitely unacceptable
(It depends)
Don't know

4.9 SHOWCARD P I mentioned earlier some other possible treatments to reduce the risk of food poisoning from meat. As I read each one out again, can you say if you think meat treated in this way should be labelled or not. READ OUT EACH IN TURN

INTERVIEWER NOTE – None of these are presently being used, but might be in the future.

The meat passes through a hot water bath or is exposed to steam in a chamber or tunnel;

The meat is exposed to ozone gas.

The surface of the meat is exposed to a rapid reduction in temperature for a short period.

Should definitely be labelled
Should probably be labelled
Should probably not be labelled
Should definitely not be labelled
Not sure

4.10 My final questions about meat are about where you shop. Do you buy most of your raw meat from a supermarket, a butcher's, a market, or some other kind of shop?

Supermarket
Butchers
Market
Other

IF SUPERMARKET ASK 4.11 ELSE GO TO 5.1

4.11 Which supermarket do you buy most of your meat from?

INTERVIEWER NOTE If respondent says "it varies" ask if there is one they go to more often

- Tesco
- Sainsbury's
- Asda
- Morrison's
- Waitrose
- Lidl
- Aldi
- Other
- Varies too much to say

DEMOGRAPHICS

5.1 INTERVIEWER RECORD RESPONDENT GENDER

- Male
- Female

5.2 What was your age last birthday?

IF REFUSED ASK 5.3 ELSE GO TO 5.4

5.3 Which of these age groups do you fall into?

- 18-24
- 25-34
- 34-44
- 45-54
- 55-64
- 65-74
- 75+

IF RESPONDENT 65+ ASK 5.4 ELSE GO TO 5.5

5.4 Are there any other people in the household aged 65 or older? IF YES How many?

- No others
- 1
- 2
- 3+

NOW GO TO 5.6

5.5 Are there any people in the household aged 65 or older? IF YES How many?

- No,
- 1
- 2
- 3+

5.6 How many children or young people aged under 17 live in this household? This could include other people's children who usually live in this household, as well as your own children.

- Enter Number
- None

IF MORE THAN ONE CHILD ASK 5.7 OTHERS GO TO 5.8

5.7 COLLECT AGES OF ALL CHILDREN/YOUNG PEOPLE AGED UNDER 17 WHO LIVE IN THE HOUSEHOLD

Enter ages

5.8 And are you the parent or main or joint carer for any of the children or young people you have told me about?

- Yes
- No

5.9 SHOWCARD Q Thinking of the income of the household as a whole, which of the groups on this card represents the total income of the whole household, before deductions for income tax, National Insurance etc. You can just read out the letter

NOTE – THIS RELATES TO THE INCOME OF EVERYONE IN THE HOUSEHOLD

5.10 Thinking of the person in the household who is the highest income earner, is he/she currently in paid work?

- Yes
- No

IF IN WORK ASK FOLLOWING QUESTIONS ABOUT CURRENT OCCUPATION. IF NOT IN WORK ASK ABOUT LAST OCCUPATION

5.11 What {is/was} his/her {last} job title?

INTERVIEWER – PROBE FOR DETAIL IF ANSWER IS “teacher”, “manager”, “engineer” etc

Never Worked – GO TO 5.18

5.12 And what {does/did} he/she mainly do in this job?

5.13 {Is/was} he/she working as an employee or self-employed?

Employee ASK 5.14

Self-employed GO TO 5.16

5.14 In this job {does/did} he/she have formal responsibility for supervising the work of other employees?

Yes

No

5.15 How many people work at the place where he/she {works/worked}? Is it

1-24

25-499

Or 500 or more

NOW GO TO 5.18

5.16 {Does/did} he/she have any employees?

On own/with partners but no employees GO TO 5.18

Has/had employees ASK 5.17

5.17 How many people {does/did} he/she employ? READ OUT

1-24

25-499

Or 500 or more

5.18 SHOWCARD R What is your ethnic group?

White

1. English / Welsh / Scottish / Northern Irish / British
2. Irish
3. Gypsy or Irish Traveller
4. Any other White background,

Mixed / Multiple ethnic groups

5. White and Black Caribbean
6. White and Black African
7. White and Asian
8. Any other Mixed / Multiple ethnic background

Asian / Asian British

9. Indian
10. Pakistani
11. Bangladeshi
12. Chinese
13. Any other Asian background,

Black / African / Caribbean / Black British

14. African
15. Caribbean
16. Any other Black / African / Caribbean background,

Other ethnic group

17. Arab
18. Any other ethnic group,

5.19 "May we recontact you in relation to this specific research should any queries arise?"

Yes

No



APPENDIX E

CHAID METHODOLOGY

Put simply, CHAID takes a dependent variable – in this case those who thought lactic acid treatment was either “acceptable” or “definitely acceptable” – and examines a number of independent variables in turn until one is found where the differences between the cells of that variable (eg the difference between men and women on the gender variable) is greater than the differences between the cells of all the other variables. This variable can then be said to explain more of the difference between those thinking lactic acid treatment acceptable and those thinking it not acceptable than does any other variable.

It should be noted that this does not necessarily mean there is a causal relationship between this identified variable and support for lactic acid treatment – they may both be the result of some other, unobserved variable – and as the sample sizes get smaller as the program works down the levels some of the differences are hard to explain in theoretical terms and may just reflect random noise. Nevertheless, CHAID is still a useful technique for finding patterns that exist and that would rarely be identified by simple cross-tabulations.

Having identified this first level variable, the CHAID program then takes the separate parts of this explanatory variable, and performs the same operation again, using only the relevant sub-samples. So if the key first level variable were indeed gender, the CHAID program would look at all the other variables to see which best explained the difference between men who supported lactic acid treatment and those who opposed it, and then look for the variable that best explained the difference between women who supported lactic acid treatment and those who opposed it.

Each level at which a single variable is found with greater explanatory power is called a node, and the CHAID program continues working down from each node until no more variables are found of which there are significant differences. The resulting output thus looks something like a genealogical tree, with each branch splitting into sub-branches until a “dead end” is reached.