ACM/997

ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

UK-WIDE SURVEY OF MICROBIOLOGICAL CONTAMINATION OF RAW RED MEAT ON RETAIL SALE

On 3 September 2010 the Food Standards Agency published its UK-wide survey of microbiological contamination of raw red meat on retail sale.
Mr Adam Hardgrave will present the findings of this survey (summary attached).

The full report can be accessed from the FSA website at:

http://www.food.gov.uk/science/surveillance/fsisbranch2010/fsis0210

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UK survey of microbiological contamination of raw red meat on retail sale

1. Between March 2006 and June 2007, 6,243 samples of fresh red meat were taken from 1,583 retail premises throughout the UK, of which 5,998 samples were acceptable for testing. The surface of samples were tested to measure the prevalence of a range of foodborne pathogens and indicator organisms, which included *Campylobacter* spp., *Salmonella* spp., *Escherichia coli* O157, *Escherichia coli*, *Listeria* spp., *Listeria monocytogenes*, *Clostridium perfringens*, *Yersinia enterocolitica*, *Staphylococcus aureus*, Enterobacteriaceae and *Enterococcus* spp. Testing for *Yersinia* spp. and *Y. enterocolitica* was carried out on 2,429 samples only.

2. Relatively few samples were positive for *Campylobacter*, *Salmonella* and *E. coli* O157 and the prevalence for these organisms were 0.36%, 0.24% and 0.02% respectively. For *Listeria* spp., *L. monocytogenes* and *C. perfringens* the prevalence was higher at 10.62%, 3.14% and 9.99% respectively. However the levels of *L. monocytogenes* and *C. perfringens* detected in the majority of samples were considered too low to cause illness. Of the other pathogens tested *S. aureus* had a prevalence of 7.18%*Y. enterocolitica* had a prevalence of 10.91%, with potentially pathogenic serotypes rarely detected (0.12%). For the indicator microorganisms, *E. coli*, Enterobacteriaceae and *Enterococcus* spp. prevalence's were 32.94%, 95.88% and 48.15% respectively.

3. Of the 3,249 beef samples tested, 4 samples (0.13%) were positive for *Campylobacter*, 6 (0.18%) for *Salmonella* and 1 (0.33%) for *E. coli* O157. *Listeria* spp. was detected in 10.88% of the beef samples and *L. monocytogenes* in 3.42%. *C. perfringens* was detected in 489 beef samples (15.01%) and of the 1,174 samples of beef tested for *Yersinia* spp., 146 (12.09%) were positive for *Y. enterocolitica*.

4. Of the 1,693 pork samples tested, 10 (0.46%) were positive for *Campylobacter*, 9 (0.51%) for *Salmonella* and none for *E. coli* O157. The prevalence of *Listeria* spp. and *L. monocytogenes* in pork was 11.54% and 2.66% respectively. *C. perfringens* was detected in 61 pork samples (3.34%) and of the 654 pork samples tested for *Yersinia* spp., 60 (9.16%) were positive for *Y. enterocolitica*.

5. Of the 1,056 lamb samples tested, 7 (0.92%) were positive for *Campylobacter* and none for *Salmonella* or *E. coli* O157. The prevalence of *Listeria* spp. and *L. monocytogenes* was 8.34% and 3.80% respectively. *C. perfringens* was detected in 55 lamb samples (5.20%) and of the 601 lamb samples tested for *Yersinia* spp., 68 (10.55%) were positive for *Y. enterocolitica*.

6. Enumeration was carried out for *Listeria* spp., *E. coli*, *C. perfringens*, *S. aureus*, Enterobacteriaceae and *Enterococcus* spp. No meat samples had *C. perfringens* levels greater than 10^4 cfu/meat sample, below the

level required to cause illness (>10^6 cfu/g). Levels of *S. aureus* exceeded 10^4 cfu/meat sample in 1.4% of the samples tested, again this is below the numbers required to produce sufficient toxin to cause illness. Hygiene indicator microorganisms Enterobacteriaceae and *Enterococcus* spp. exceeded 10^4 cfu/meat sample in 1.4% and 7.6% of samples respectively. Only 7.4% of non-pathogenic *E. coli* and 0.6% of *Listeria* spp. exceeded 100 cfu/meat sample. However, it should be noted that only 4 (0.06%) of samples were positive for *L. monocytogenes* at levels above 100 cfu/meat sample.

Key facts

7. The key findings were that:

- The survey results indicate that *Campylobacter* spp. contamination on red meat is very low. *Campylobacter* was detected on the surface of only 21 of the 5,998 meat samples tested giving an overall prevalence of 0.36%; it was more prevalent in lamb meat than other types of meat. The predominant *Campylobacter* species was *C. jejuni*, which was detected in 20 of the 21 positive samples, *C. coli* being detected in the other.

- *Salmonella* spp. was detected on the surface of only 15 of the 5,998 meat samples tested giving a prevalence of 0.24%. Of the red meats sampled, pork exhibited the highest prevalence rate for *Salmonella.* The most predominant *Salmonella* serotype found in the red meat tested was *S.* Cerro which was detected in 7 samples.

- *E. coli* was detected on the surface of 1,970 of the 5,998 red meat samples tested giving a prevalence of 32.94% and was more prevalent on pork (36.4%) than the other meat types. However, *E. coli* O157, the most significant pathogenic type of *E. coli*, was only detected on 1 sample (beef) giving a prevalence of 0.02%.

- *Listeria* spp. was detected on the surface of 619 of the 5,998 samples tested resulting in an overall prevalence of 10.62%. Non-pathogenic *L. welshimeri* was the most predominant species confirmed being found in 349 (6.01%) samples. *L. monocytogenes* was found in 185 samples giving a prevalence of 3.17% and was more prevalent on lamb and beef. The majority of *L. monocytogenes* (90.3%; n=167/185*)* detected was present at less than 10 cfu/meat sample with only 2.4% (n=4/185) samples greater than 100 cfu/meat sample. These results confirmed that the levels (cfu) of *L. monocytogenes* found on the surface of whole cuts of retail red meat were low and below the level of concern for ready to eat foods (>100 cfu/g).

- *C. perfringens* was detected on the surface of 605 of the 5,998 red meat samples tested giving a prevalence of 9.99% and was more prevalent on beef. Most of the *C. perfringens* (85.9%; n=521) detected was present at less than 10 cfu/meat sample. Sixty eight (11.4%) and

15 (2.6%) had levels of 10-100 cfu/meat sample and 100-1,000 cfu/meat sample respectively whilst only 1 (0.2%) sample had *C. perfringens* at 1,000-10,000 cfu/meat sample. No meat samples had *C. perfringens* levels greater than 10,000 cfu/meat sample; levels of over 10^5 cfu/g are needed to cause illness.

- The prevalence of the non-pathogenic microorganisms ranged from 7.18% to 95.88%.

Aims of the survey

8. The aims of the red meat survey were to:

    - Provide data on the prevalence of microbiological contamination on the surface of fresh red meat on retail sale in the UK. Samples were tested for a range of foodborne pathogens and indicator organisms, including the 5 key pathogens against which the FSA monitors foodborne disease – *Campylobacter* spp., *Salmonella* spp., *E. coli* O157, *L. monocytogenes* and *C. perfringens*. Tests were also undertaken for other pathogenic and hygiene indicator organisms including *E. coli*, *Listeria* spp., *Y. enterocolitica*, *S. aureus*, Enterobacteriaceae and *Enterococcus* spp.

    - Record information on a wide range of factors such as retailer type, country of origin, production type and the type and cut of meat.

9. Background and approach

10. One of the key strategic aims of the Food Standards Agency is to reduce the incidence of foodborne illness in the UK. To support this aim the Agency monitors the number of laboratory reported cases and indicators of burden of disease for 5 key organisms *Campylobacter*, *Salmonella*, *E. coli* O157, *L. monocytogenes* and *C. perfringens*. During 2006, it was estimated that over 1 million people suffered from food poisoning in the UK with 19,500 hospitalisations and over 500 deaths as a result of foodborne illness.

11. From 2000 to 2008, 7.9% of the 793 foodborne outbreaks in England and Wales reported to the Health Protection Agency (HPA) were associated with the consumption of red meat. During this period 1,618 people were affected with 130 hospital admissions and 12 fatalities. Beef (48%) was the most frequently associated meat type, followed by pork (22%) and lamb (13%). *C. perfringens* (40%), *E. coli* O157 (21%) and *Salmonella* (19%) were the most frequently reported microorganisms in red meat related outbreaks, outbreaks of illness caused by *L. monocytogenes* or *Y. enterocolitica* linked to red meat were not reported (source HPA GSURV outbreak database March 2010).

12. The Agency 2005-2010 strategic plan has specific targets in reducing the incidence of pathogenic microorganisms (such as *Campylobacter* and

Salmonella) in the food chain by 2010. To support these targets the Agency has carried out this survey to examine the prevalence of microbiological contamination on the surface of cuts of fresh red meat on retail sale throughout the UK.

13. Previous surveys reported in the literature on red meat have focussed on the levels of contamination on carcasses at the abattoir or on diced meat, minced meat and meat preparations such as sausages and burgers. These surveys generally had a small size, tested for only a few microorganisms and contained limited data of relevance to the UK. An exception was the large UK wide survey carried out in 2003-2005 by LACORS/HPA on *Campylobacter* and *Salmonella* on fresh meat at retail sale however this survey also included poultry, game meat, offal and diced samples. No UK wide surveys have been undertaken to look at whole cuts of fresh red meat at retail sale.

14. The Agency has carried out a comprehensive survey to address the knowledge gaps and the data gathered will help to build up a representative picture of the microbiological contamination found on the surface of retail red meat in the UK. The findings can be used to help assess how effective hygiene and other controls have been through production and processing up to the point of sale to the consumer and the potential cross-contamination risks to the consumer through handling of these products in the domestic kitchen. The survey outputs will help to inform food safety advice given to consumers on how to avoid cross-contamination in the kitchen during the handling of fresh meat.

15. The Central Science Laboratory[1] co-ordinated the survey and samples were collected by dedicated samplers from 1,583 retail premises. Samples were taken according to market share and were representative of the UK market for fresh red meat with retail premises selected at random in England, Scotland, Wales and Northern Ireland. The survey was not designed to measure seasonal effects.

16. A range of information concerning the red meat samples was collected including sampler details, retail premises details (name, address and type), species and cut of meat, brand/product name, type of packaging, production type, country of origin (where possible), identification mark, use by date, cost and net weight. The methods used were based on ISO methods or equivalent validated methods.

17. The survey was designed to allow comparison between the prevalence and levels of different microorganisms associated with different meat types and cuts and types of retailers. An initial sample size of 5,000 samples was set to ensure that the prevalence for all microorganisms could be measured to a minimum precision of ±2% for each meat type (beef, pork and lamb) without stratifying the sampling plan. In this survey the sample

[1] With effect from the 1st April 2009, the Central Science Laboratory (CSL) changed their name to the Food and Environment Agency (FERA).

numbers for Scotland and Northern Ireland were boosted, to allow for robust statistical comparisons of contamination of red meat in these countries. The total sample size was therefore revised to 5,919 red meat samples.

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