

# **Annual Report of the Chief Scientist 2012/13**

---

**Safer food for the nation**

# Contents

<b>Introduction from the Chief Scientist</b>	<b>4</b>
<b>Chapter 1: Foodborne disease</b>	<b>7</b>
<b>Issues and actions</b>	<b>7</b>
1.1 Burden of disease	7
1.2 Trends	10
1.3 Campylobacter	11
1.4 <i>Listeria monocytogenes</i>	16
1.5 Norovirus	18
1.6 <i>Escherichia coli</i>	22
1.7 Salmonella	25
1.8 Reported behaviour associated with food safety risks	26
1.9 New tools to investigate foodborne outbreaks	27
<b>Chapter 2: Nutrition, diet and health</b>	<b>29</b>
<b>Diet and nutrition</b>	<b>29</b>
2.1 Supporting a healthy lifestyle	30
2.2 An update on front-of-pack labelling	30
2.3 Monitoring progress towards dietary targets	31
2.4 National Diet and Nutrition Survey	32
2.5 Diet and Nutrition Survey of Infants and Young Children	34
2.6 Salt intakes	36
<b>Adverse reactions to food</b>	<b>37</b>
2.7 Trends in food allergy and intolerance	37
2.8 Food Allergy and Intolerance Research Programme	41

<b>Chapter 3: Using science and evidence to develop policy</b>	<b>46</b>
<b>Policy development</b>	<b>46</b>
3.1 The review of the delivery of official controls	48
3.2 Update on the modernisation of meat controls	52
<b>Monitoring</b>	<b>57</b>
3.3 Monitoring food safety during the 2012 Olympics and Paralympics	57
3.4 Horse meat in beef products	58
<b>Chapter 4: Research highlights and expenditure</b>	<b>63</b>
<b>Science and evidence</b>	<b>63</b>
4.1 Analysis of our science and evidence expenditure	63
<b>Science and evidence highlights</b>	<b>64</b>
4.2 Hygiene and microbiology	64
Norovirus research	64
Reducing <i>E. coli</i> O157 shedding in cattle	66
4.3 Chemical safety	68
Metal uptake in fruit and vegetables	68
Threshold allergenic doses	70
4.4 Dietary health and nutrition	73
Diet among children in Scotland	73
4.5 Effective risk-based enforcement and compliance	75
Evaluation of cross-contamination guidance	75
4.6 Cross-cutting and strategic research	77
Consumer views on labelling of genetic modification in food	77
<b>Chapter 5: Our science and evidence strategy</b>	<b>80</b>
<b>Priority activities</b>	<b>80</b>
5.1 Identifying the evidence we need	81
5.2 Partnerships	82
5.3 Interpretation, knowledge transfer and translation	83
Science governance	83
5.4 Appraisal and evaluation	85
Evaluation of the food hygiene standards initiative	85
5.5 Knowledge, skills and capabilities	87
Scientific advisory committees	87

<b>Chapter 6: Outlook</b>	<b>89</b>
<b>What does the future hold?</b>	<b>89</b>
6.1 The coming year	89
6.2 Identifying risks	90
6.3 Root cause analysis	90
6.4 Tackling food fraud	91
6.5 Horizon scanning	91
6.6 Global food supply chain	92
<b>Glossary of Terms</b>	<b>96</b>
<b>References</b>	<b>99</b>
<b>Annexe A – Agency science and evidence expenditure 2012/13</b>	<b>109</b>
<b>Annexe B – Tables of co-funded projects</b>	<b>126</b>
<b>Annexe C – Universal ethical code for scientists</b>	<b>129</b>

## Introduction from the Chief Scientist



I am pleased to introduce my seventh Annual Report, covering the period from 1 April 2012 to 31 March 2013. My report gives you a broad overview of the science and evidence work we are funding and highlights how this is used to meet the challenges of delivering safer food for the nation.

From its establishment, the Agency has had science at the centre of its policy formulation and advice. I am delighted that the quality of our research and science and evidence-based decision making was recognised in the Capability Review<sup>a</sup> of the Agency, published in October 2012. The review also saw us as a leading organisation in consumer engagement. It confirmed our strengths and recognised that we have a clear, concise and coherent strategy.

The public health impact of gastrointestinal infection continues to be significant. Reducing the burden of foodborne illness in the UK is and remains one of our key objectives. Chapter 1 of this report provides details of our work to tackle this, and it provides trends over time of the five major species of foodborne pathogens monitored by the Agency, notably campylobacter, *Listeria monocytogenes*, norovirus, *E. coli* and salmonella. We are focusing our efforts on these pathogens, which represent the major causes of UK foodborne disease and the greatest burden in terms of number of cases and severity of disease. We will continue to work in collaboration with others, including the food industry, to reduce levels of microbiological contamination in food.

There are updates on the research work we have funded over the past year aimed at reducing food poisoning due to campylobacter. The Campylobacter Strategy Workshop held in March 2013 provided the opportunity to review the progress in addressing this ongoing challenge.



<sup>a</sup> The Capability Review programme is part of the wider Civil Service reform agenda. The reviews provide an assessment for departments against a model of capability and identify the department's progress and next steps.

The report also describes the important work we are undertaking to develop a better understanding of foodborne viruses in the food chain, in particular the winter vomiting bug – norovirus – which is the most common cause of infectious intestinal disease and viral food poisoning in the UK.

Chapter 2 describes our work on nutrition, diet and health. It brings together the underpinning work undertaken in the past year, to support nutrition policy in Scotland and Northern Ireland. This continues to be an important part of our remit in these countries; however, responsibility for dietary health in England and Wales has moved from the Agency to the respective health departments.

This chapter also provides an update on trends in food allergy and intolerance and you can find out about our work to investigate the causes and mechanisms underlying these responses to food. I am also pleased to report that the independent review of the Agency's Food Allergy and Intolerance Research Programme noted the high scientific quality of the programme. It also identified potential priority areas for funding over the next five years.

Chapter 3 provides examples of how we use the knowledge gained from our scientific work to develop policies and advice to protect consumers. Our effort on the review of the delivery of official controls and the evidence-based assessment of the impact of any proposed changes are examples. This work, together with other developments, led to our Board's decision to close the review, although this work will be taken forward with local authority partners. My last report described the first phase towards the reform of the current system of official meat controls. The second phase, aimed at improving public health protection while delivering a more risk-based and proportionate system, is also described here.

Since the start of 2013, the Agency has been involved in a range of activities to investigate the contamination of beef with horse meat. The work undertaken, ranging from testing and surveillance to establish the extent of any contamination and its causes, to the ongoing effort to determine the difference between gross and trace contamination, is detailed in Chapter 3.

At the start of the reporting year we were preparing for the 2012 Olympic and Paralympic Games in London. We implemented a large programme of work with local authority partners and food businesses to provide food safety assurances both ahead of and during the Games. A gold medal would have been awarded to all if there was a category for top performance in food safety! You can find out more in Chapter 3.

Chapter 4 presents some examples of outputs from our research programmes, such as:

- a critical review of methods to distinguish infectious and non-infectious norovirus
- a study on metal uptake in fruit and vegetables
- work carried out on threshold doses for allergenic foods



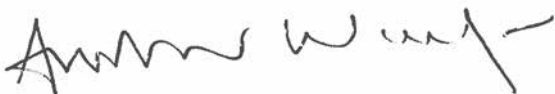
Summary tables with information about all of the science and evidence-gathering projects funded by us in the past year, including financial information, can be accessed in Annexe A. If you are reading this online, the report is interactive allowing you to link to information about the projects on our website and the detailed peer-reviewed final reports on our open access repository Foodbase.

Our Science and Evidence Strategy includes five priority activity themes which outline the actions we take to obtain and use evidence effectively. Progress made under each theme is described in Chapter 5. One important example is the actions we have taken to address areas for improvement identified in a review of science governance in the Agency. You can also find out about what we are doing to develop our partnership work. The Capability Review recommended more collaborative work to develop collective ownership of food and feed safety.

And finally, Chapter 6 brings together the work we are doing to identify risks, tackle food fraud, and identify potential new threats, to deliver safe food in the long-term.

This report has been written in a style that aims to make our work accessible to a wide audience. We have provided web links to our research and policy pages in the online version of the report, should you want to investigate any topic or area of research in more detail.

The report, and the work described in it, is a collective effort by the scientists and other staff in the Agency, as well as many external scientists and wider stakeholders. I would like to recognise their dedication during the past year and to all of those we collaborate and work with, in helping us to meet our vision of safer food for the nation.



**Andrew Wadge**  
**Chief Scientist**  
**Food Standards Agency**

# Chapter 1: Foodborne disease

## Issues and actions

Food safety is the Agency's top priority and the reduction of foodborne disease is one of our key objectives to achieve this. Our current best estimate suggests that there are around a million cases of foodborne illness in the UK each year, resulting in 20,000 hospital admissions and contributing to around 500 deaths. The model used for these estimates will be reviewed later in 2013 following the publication of an extension to the second study of Infectious Intestinal Disease in the community (IID2 study), which relates to the proportion of disease that is foodborne.

The majority of foodborne illness can be prevented. There is scope to reduce levels of disease by reducing contamination at all stages of food production, processing and preparation.

### 1.1 Burden of disease

It is recognised that the number of laboratory-confirmed cases of infection from key foodborne pathogens is lower than the actual number of these infections. This is because affected individuals often fail to report the illness to their GP or other clinician. To take account of this underreporting, and in order to provide a measure of the severity of disease caused, we calculate estimates of the actual number of cases, hospital admissions and deaths for each pathogen. Current estimates are largely based on the first study of Infectious Intestinal Disease (IID) which took place in the mid-1990s.<sup>1</sup> As this study was undertaken in England, its findings can only be used to produce reliable estimates for England and Wales, because the surveillance systems are comparable, but cannot be extended to the other UK countries where reporting systems differ.

Figure 1 on the next page illustrates the difference in estimated burden of foodborne disease in the community in England and Wales in 2011, caused by the five major pathogens monitored by the Agency: campylobacter, *Listeria monocytogenes*, norovirus, *E. coli* O157 and salmonella.

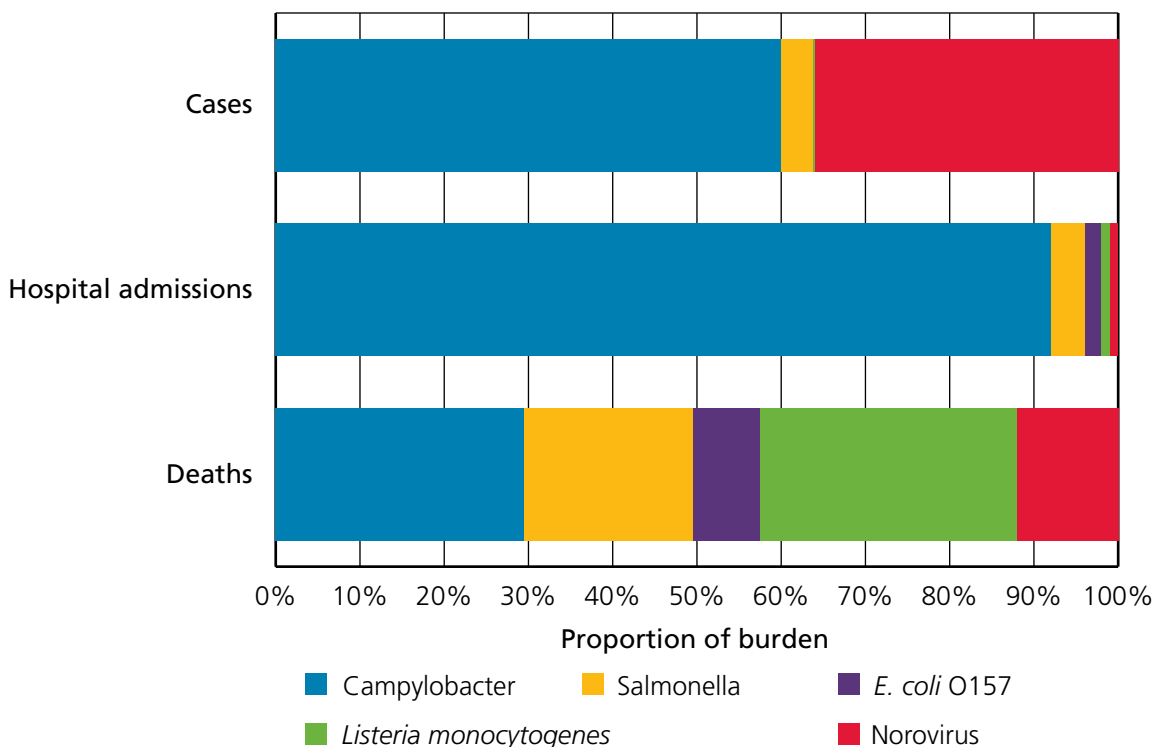




Of these five pathogens, campylobacter remains the most frequently reported cause of foodborne disease (60%) in England and Wales, and the highest proportion of hospitalisations (92%). Although foodborne illness due to *L. monocytogenes* is relatively rare (<1%), it is associated with the highest mortality (30%).

The report of the IID2 study, which covered disease across the whole of the UK, was published in 2011.<sup>2</sup> The purpose of the study was to determine the incidence of infectious intestinal disease in the UK, which microorganisms cause it and to find out if the situation had changed since the first IID study. A secondary aim was to compare official national surveillance statistics with the 'true' level of intestinal disease experienced by people in the community. The study showed that the public health impact of gastrointestinal infection continues to be significant. Around 25% of the population suffers from an episode of intestinal infectious disease each year – equivalent to 17 million cases annually. Additional work has been funded to update the models used to estimate the burden of foodborne disease. This work will enable us to produce better estimates for the whole of the UK.

**Figure 1** Relative proportion of burden in terms of cases, hospital admissions and deaths for five key pathogens (England and Wales 2011)<sup>b</sup>



**b** 1) There is uncertainty in the estimates of burden of disease, which are based on the first IID study. The model used for these estimates will be reviewed later in 2013 following the publication of the IID2 extension study. 2) There is further uncertainty in the proportion of norovirus cases that can be attributed to food as there are still significant gaps in scientific knowledge. 3) The number of cases caused by each pathogen varies widely. The percentage of estimated cases for *L. monocytogenes* and *E. coli* O157 were particularly low in comparison with campylobacter and salmonella. 4) At the time of writing, the 2012 figures were not available.



We estimate the cost of foodborne illness in England and Wales annually, as a way of measuring resource and welfare losses attributable to foodborne pathogens. The estimated cost for England and Wales in 2011 was £1.6 billion. Table 1 provides a breakdown of how the estimated annual costs arose. The ascertainment rates in England and Wales were used to estimate the costs for Scotland and Northern Ireland. The cost for the whole of the UK was estimated to be around £1.8 billion.

**Table 1** Estimated economic burden from foodborne pathogens in England and Wales<sup>c</sup>

Year	Economic costs (£m)			
	NHS	Lost earnings and other expenses	Pain and suffering	Total cost
2003	24	100	1,363	1,487
2004	33	134	1,829	1,996
2005	28	117	1,530	1,675
2006	27	110	1,412	1,549
2007	27	115	1,442	1,585
2008	28	121	1,444	1,593
2009	37	154	1,836	2,027
2010	33	147	1,506	1,686
2011	31	136	1,397	1,564

Our Foodborne Disease Strategy 2010 to 2015 aims to tackle foodborne illness by targeting the pathogens that have been identified as causing the greatest burden of disease.<sup>3</sup>

These are:

- campylobacter
- *L. monocytogenes*
- norovirus

<sup>c</sup> 1) Estimates are based on data for over 20 organisms, including the Agency's five key pathogens, but excluding pathogens of unknown aetiology. 2) To compensate for inflation, costs have been based on 2012 quarter 1 prices, to allow for comparison to be made between years. 3) The method of estimating the cost of pain and suffering is based on epidemiological data supplied by the Health Protection Agency (this work transferred to Public Health England on 1 April 2013) which enables estimates of the following outcomes: death, permanent incapacitation, minor and major illness. As the economic cost was not considered in the first IID study, the costs could only be established indirectly using methodologies consistent with those used by the Department for Transport and the Health and Safety Executive, further details are available from [www.dft.gov.uk/webtag/documents/expert/pdf/unit3.4.1.pdf](http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.4.1.pdf) and [www.hse.gov.uk/research/rrpdf/rr897.pdf](http://www.hse.gov.uk/research/rrpdf/rr897.pdf). 4) The results of the IID2 extension study were not available at the time of writing. The model used for these estimates will be reviewed in 2013 following the publication of the IID2 extension.

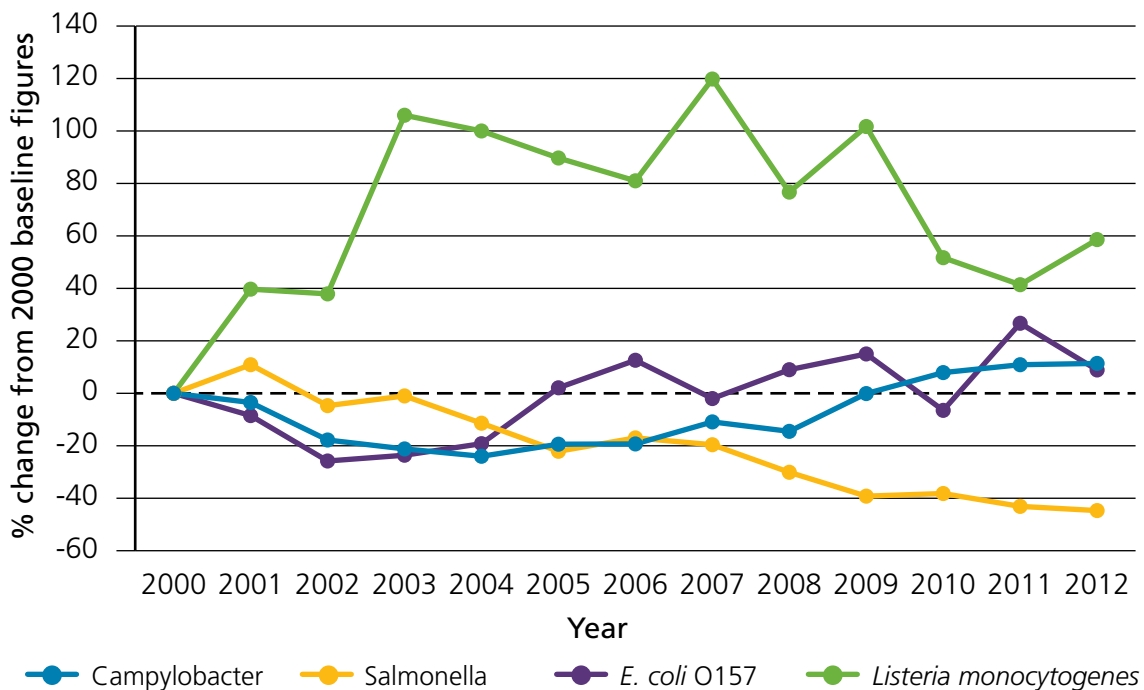
The Agency is also tackling other important pathogens, for example *E. coli* O157 through a programme of research (see section 1.6) and the control of salmonella is addressed through the Defra-led National Control Programmes for the control and reduction of salmonella.<sup>4</sup>

### 1.2 Trends

We use the number of reported laboratory-confirmed cases of foodborne disease from the five key pathogens monitored by the Agency, to monitor trends over time. These pathogens represent the major causes of UK foodborne disease and the greatest burden in terms of number of cases and severity of disease.

Figure 2 below represents the percentage change of the UK laboratory-confirmed reports for four of the key pathogens monitored since 2000, compared with the baseline of the number of laboratory-confirmed cases of illness reported in 2000.

**Figure 2** Percentage change in all laboratory-confirmed cases of campylobacter, salmonella, *E. coli* O157 and *Listeria monocytogenes* compared to 2000 figures



It should be noted that due to the small number of cases of laboratory-confirmed cases of listeriosis, the percentage change from baseline is affected significantly by a relatively minor change in the number of reports.



We started to monitor UK laboratory-confirmed cases of norovirus in 2005. The data for norovirus indicates an overall increase in confirmed cases of 212% from the 2005 baseline. The increase is thought to be due at least in part to improvements in the methodology for detection of norovirus and its more widespread use in surveillance by laboratories. In addition, it should be noted that many cases that are reported in national surveillance are linked to outbreaks that occur in semi-enclosed settings which facilitate the effective spread of infection, such as healthcare settings, schools or cruise ships, and may be less likely to be associated with a foodborne source or vehicle.

An outbreak of foodborne illness is defined as either two or more linked cases of the same disease, or when the observed number of cases unaccountably exceeds the expected number.<sup>5</sup> The Agency is involved in investigating serious localised outbreaks and non-localised outbreaks (for example, involving more than one local authority). We carry out this work to protect public health in collaboration with local authorities, Public Health England, Health Protection Scotland, Public Health Wales and the Public Health Agency in Northern Ireland. An example of an outbreak that the Agency was involved in investigating during the past year is provided in the section on *E. coli*, see section 1.6.

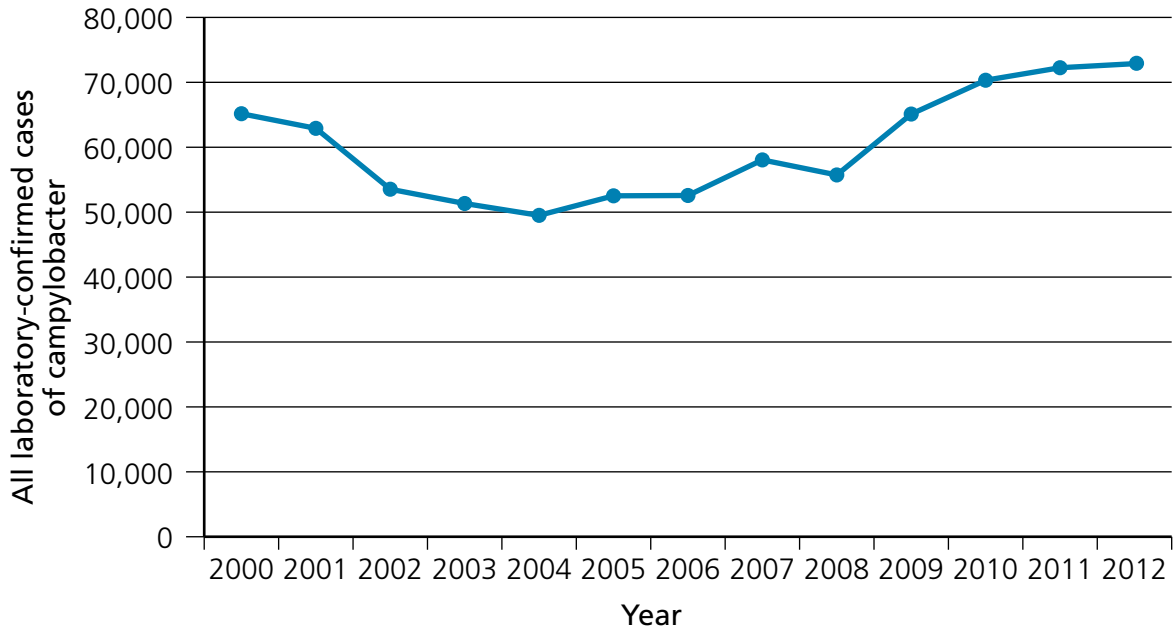
Individual UK trends, issues and actions for each of the key pathogens that we monitor are considered in more detail below. It should be noted that data for 2012 are provisional.

### 1.3 Campylobacter

Campylobacter causes severe diarrhoea and abdominal pain and in some cases longer term chronic after effects. It is the most common bacterial cause of food poisoning in the UK. It can colonise the digestive track of a variety of farm animals, and meat can become contaminated during the slaughter process. Campylobacter frequently occurs on raw chicken meat but can also be found on other poultry, red meat, offal and unpasteurised milk. Although it does not normally grow in food at typical food production and storage conditions, it spreads easily and has a low infective dose. Only a few bacteria, whether on the surface of a piece of raw chicken, or transferred from raw chicken onto other ready-to-eat foods, can cause illness.

Over recent years the number of laboratory-confirmed cases of campylobacter has continued to rise, see Figure 3 on the next page. There were 72,571 laboratory-confirmed cases in 2012, compared with 72,249 in 2011 – an increase of 0.04%.

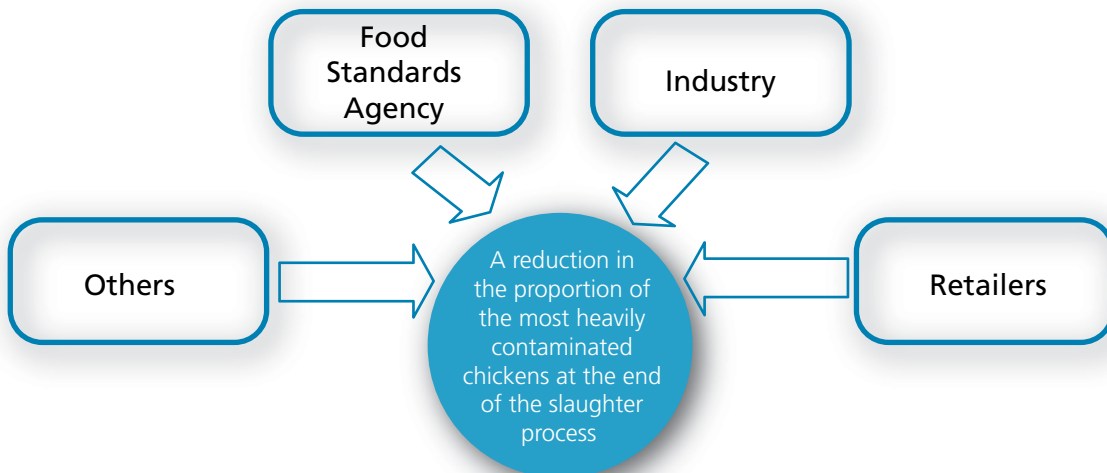
**Figure 3** Laboratory-confirmed cases of campylobacter in the UK, 2000 to 2012



**Campylobacter Risk Management Programme**

The Agency’s Campylobacter Risk Management Programme, is a targeted programme of work within the Foodborne Disease Strategy, aimed at reducing cases of human campylobacter infections.<sup>6</sup> We are working in partnership with interested parties towards a jointly agreed target.

**Figure 4** Working in partnership towards an agreed target



The target is to reduce the proportion of the most heavily contaminated chickens at the end of the slaughter process from 27% to 10% by April 2015. It is estimated that achieving this target could mean a reduction in human campylobacter food poisoning of up to 30%.

The Joint Working Group on Campylobacter is a partnership between the Agency, the poultry industry, retailers, the British Poultry Council, the British Retail Consortium, the National Farmers Union and the Department for Environment, Food and Rural Affairs (Defra).<sup>7</sup> Its aim is to enable the development of more effective control measures, based on excellent underpinning science, in order to meet the needs of the consumer and industry. To contribute to this work we are funding research in collaboration with the Biotechnology and Biological Sciences Research Council (BBSRC), Defra, the Northern Ireland Department for Agriculture and Rural Development and the Scottish Government.<sup>8</sup> The priorities that were identified when this strategy was published in 2010 have recently been reviewed. See page 15.

Over the past year, we have devoted around £1.7 million of funding towards research aimed at reducing campylobacter food poisoning. We are working within the Joint Working Group on an integrated farm-to-fork approach, to identify and implement a range of interventions targeted at different points in the food chain, to reduce campylobacter in chicken through on-farm, transport, slaughterhouse and factory practices.<sup>9</sup> However, we recognise that it is likely to take time before the implementation of successful interventions has a demonstrable impact on human cases.

### **Biosecurity measures**

Previous studies have suggested that progress may be possible through the consistent application of stringent biosecurity measures, to control campylobacter colonisation in poultry flocks. New on-farm standards for biosecurity were introduced through the 'Red Tractor' Farm Assurance Poultry Scheme in 2011. Audit inspections have found that the required facilities are in place and in use at premises of all scheme members. A number of government and industry funded projects are underway to determine the efficacy of these biosecurity measures on levels of campylobacter in flocks and chicken carcasses. Early indications from these projects suggest that compliance with these biosecurity interventions, as determined at a periodic audit, has not yet resulted in the campylobacter reductions that were predicted through modelling. Further data collection and analysis will continue.

### **Poultry processing**

A risk factor analysis of data collected during the EU baseline study for campylobacter in 2008, found that there were differences in the levels of campylobacter on carcasses from different slaughterhouses, which were independent of the level of campylobacter carried in the chicken's guts. We are funding work to measure the levels of campylobacter on the chicken at various points during the slaughter process, in plants that produce over 80% of the chickens in the UK. We will attempt to identify processing



points that may account for the differences observed in the numbers of campylobacter. Early findings from this project have shown that the washing and chilling stages appear to have a variable effect on campylobacter levels.

We are funding work in collaboration with industry on interventions to reduce campylobacter levels on chicken in poultry processing plants. The risk of food poisoning can be reduced by using slaughterhouse decontamination treatments on raw meat. Research includes testing the efficacy of post-processing treatments, such as the use of lactic acid and rapid surface blast chilling. The rapid surface chilling process exposes the surface of the meat to a very cold environment for a very short period of time. Initial experimental trials have suggested the process can be effective in significantly reducing the number of campylobacter bacteria on the surface of the meat, which seems particularly sensitive to cold shock treatment. However, before the process can be considered for use on a commercial scale, clarification is needed of whether the process complies with current poultry meat marketing regulations to allow the treated meat to be marketed as 'fresh'. Given the potential food safety benefits, we are currently working with Defra to explore the legal issues with the European Commission.

### Issues for consumers

During the past year we funded research to investigate consumers' attitudes towards slaughterhouse decontamination treatments for raw meat, including lactic acid and rapid surface chilling, and whether they considered some of the possible treatments acceptable.<sup>10</sup> A survey of over 2000 consumers was commissioned to gather information on the acceptability of different decontamination treatments and labelling preferences. Initial reactions to the treatments were either negative or neutral, with consumers less accepting of chemical treatments (such as lactic acid) than physical treatments (such as rapid chilling). However, after being provided with further information on the treatments, more consumers found them acceptable than unacceptable, with 54% accepting lactic acid treatment and 69% accepting rapid surface chilling. The results suggest that the specific information presented to the public about decontamination treatments for raw meat is likely to have a considerable impact on public opinion.

Undercooked chicken liver pâté has continued to be linked to outbreaks of campylobacteriosis, particularly when served at catered functions. Campylobacter is sensitive to freezing, which could be a control for the safe preparation of such dishes. However, there was a lack of evidence on whether freezing could be an effective way to control campylobacter contamination in chicken livers, particularly under conditions similar to those in catering or domestic kitchens where freezer temperatures and freezing rates may vary. We therefore funded research, which has indicated that freezing chicken livers can reduce, but not eliminate, campylobacters.<sup>11</sup> This will help to inform our advice to caterers and consumers.

A pilot study is underway in preparation for a microbiological survey to determine both the presence and level of campylobacter contamination on whole raw chicken at retail sale in the UK.<sup>12</sup> The survey aims to establish campylobacter contamination on chickens collected at point of retail sale which could then be compared to the survey data on campylobacter contamination in chickens collected at the end of the slaughter process, which could allow benchmarking to determine if changes at the slaughterhouse are reflected at retail. The main survey will also sample chicken packaging, to determine the extent of contamination on the exterior of packaging. This will help us to assess the impact of the introduction of leak-proof packaging on whole raw chickens, to prevent drip-loss and cross-contamination, which we continue to encourage as the standard across the industry.

### Assessing progress

By mid-2013, our independent monitoring of UK chickens at slaughter will have collected and analysed twelve months of sampling data. We will review the Campylobacter Risk Management Programme 2010 to 2015 later in 2013, to assess progress to date, to review the basis of the reduction target, and to refresh and refocus the current strategy and identify new activities that could contribute to the control of campylobacter.

The Agency, the BBSRC and Defra jointly organised a Campylobacter Strategy Workshop in March 2013. This provided an update on the progress of the campylobacter research being funded. Possible future developments were discussed to ensure the strategy will achieve its goals. See the text box below.

## In focus

### Campylobacter Strategy Workshop

This workshop provided an opportunity to review the progress on research to address the ongoing challenges, and to consider whether the UK Research and Innovation Strategy for Campylobacter is on track. Researchers, funders, industry personnel and policy makers were:

- updated on the latest research developments
- asked to consider whether there was a need to re-direct resources to particular areas of work
- asked to identify research priorities for the future



BACK TO  
CONTENTS





The presentations highlighted that on-farm control of campylobacter was currently a challenge, due to the lack of an effective vaccine for poultry, and the paucity of evidence for biosecurity measures which were capable of reducing the levels of contamination in flocks. The findings of experimental trials of treatments for reducing campylobacter levels on chicken in poultry processing plants have highlighted the potential of rapid surface chilling as an intervention which should be explored in the short term.

Delegates attending the workshop concluded that a revision of the Research and Innovation Strategy for Campylobacter was not required, but several areas were identified that merited further attention. In particular:

- it was highlighted that there was a need for more social science studies on human behaviour to identify ways of ensuring consistent application of hygiene measures, in settings including on-farm, during processing and during commercial food production
- there was wide support for expanding the application of whole genome sequencing techniques to improve our understanding of the attribution of campylobacter infection
- there was support for the long-term research to support vaccine development to continue

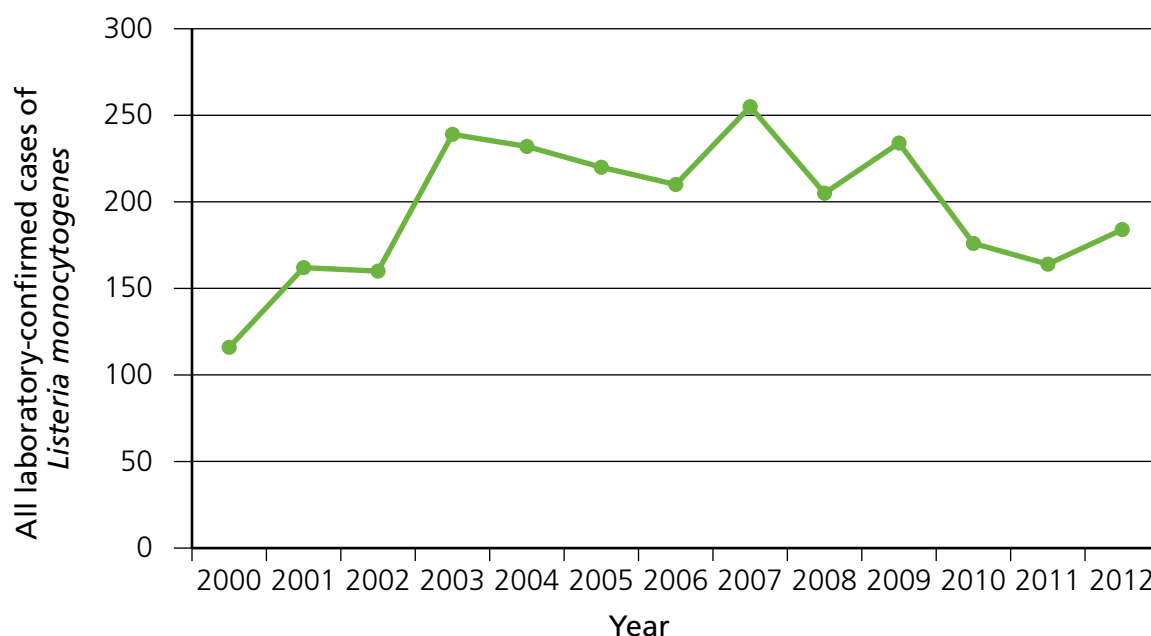
#### 1.4 *Listeria monocytogenes*

Listeriosis, the foodborne illness caused by *Listeria monocytogenes*, is relatively rare but listeria causes more deaths from food poisoning in the UK than other foodborne pathogens. Some adults experience only mild infections but *L. monocytogenes* can lead to severe blood poisoning (septicaemia) or meningitis. Most people infected with listeria are hospitalised and approximately a third die. *L. monocytogenes* is therefore identified as a priority for action in our Foodborne Disease Strategy for 2010 to 2015.<sup>3</sup> People who have reduced immunity, such as pregnant women, people aged 60 years and over, and those with specific underlying medical conditions and/or undergoing certain drug treatments, are at increased risk of listeriosis.

Between 2000 and 2007, the annual number of laboratory-confirmed cases of listeriosis in the UK more than doubled. Although there has been an overall decrease in cases since 2003, there was a slight increase in laboratory-confirmed cases in the past year, with 184 cases in 2012 compared with 164 cases in 2011. See Figure 5 on the next page.



**Figure 5** Laboratory-confirmed cases of *Listeria monocytogenes* in the UK, 2000 to 2012



### Listeria Risk Management Programme

The Agency's Listeria Risk Management Programme for 2010 to 2015, targets our activities to the population groups, healthcare settings and industry sectors where the risk is highest, to achieve the greatest public health gains.<sup>13</sup> Our activities are focused on developing updated food safety advice for vulnerable groups of consumers, with the initial emphasis on high risk foods and lower risk choices. Our intention is to publish this updated advice on NHS Choices in the first instance. We will then work with partners to develop and actively communicate more focused advice to pregnant women, older people (particularly those with weakened immunity) and cancer patients (particularly those with blood cancers and /or undergoing treatment).

### Reducing the risk of listeriosis to vulnerable people

As an interim measure we published an information sheet in 2013, aimed at staff in hospitals and nursing and residential care homes. This outlines simple practical steps that can be taken to reduce the risk of listeriosis to vulnerable people in their care.<sup>14</sup> The advice was actively disseminated to healthcare settings across the UK.

During the coming year, we plan to develop guidance aimed at NHS hospitals to help them reduce the risk of exposure to listeria in vulnerable patients. It is expected to cover the supply chain, from food procurement to service at ward level. The guidance will explain why listeria is a particular risk for vulnerable groups, the extent of the problem,



routes of transmission, and critical control points to consider when procuring and providing food for vulnerable patients in NHS hospitals. The outcomes of a review of public health sector procurement, which is expected to report later in 2013, will be used to inform this project.

### Identifying and controlling risks in food

We are also preparing simple guidance for businesses and enforcement officers on the EU Microbiological Criteria Regulation (2073/2005), as it relates to *L. monocytogenes* in ready-to-eat foods. We will work with our partners during 2013 to ensure the guidance meets the needs of small businesses that produce foods that are high-risk for *L. monocytogenes*, and where the control and management in food is critical.

We published a critical review of current practices in the management of *L. monocytogenes* in smoked fish production in 2012.<sup>15</sup> This identified the key production and processing practices that could potentially influence the prevalence of *L. monocytogenes*. We expect to fund further research to identify the original source of contamination of listeria in ready-to-eat smoked fish production and the factors supporting processing plant colonisation.

A survey was carried out to determine the prevalence and levels of *L. monocytogenes* contamination in pre-packed ready-to-eat sliced meats at retail sale in premises classed as small to medium sized enterprises. The results are expected to be available later in the year. The survey aimed to concentrate on smaller businesses, which may present an increased risk due to their size. This was to address a gap in our knowledge regarding this type of premises.<sup>16</sup> Similar previous surveys have covered larger retailers that represent the majority of the market for these products. The survey included: pre-packed cooked, cold sliced meats such as ham, beef, turkey and chicken; sliced cured meats such as Parma ham; and sliced fermented meats such as salami and chorizo sausage. We are also funding a comprehensive review of current practices in the management of *L. monocytogenes* during the production of cooked, sliced meat in the UK, which began in 2013.<sup>17</sup> This will help to identify key risk areas in the processing chain and potential gaps in the management of these.

The results of these research projects will be used to inform the development of a UK-wide decision support tool aimed at these high-risk industry sectors. This could assist industry in the identification and control of *L. monocytogenes* risks specific to their processing environment.

## 1.5 Norovirus

Norovirus, which is also commonly known as the winter vomiting bug, is the most common cause of infectious intestinal disease and viral food poisoning in the UK. Direct person-to-person transmission is a key route of norovirus spread, although contaminated foods and food handlers are also considered to be an important route of infection. Norovirus illness, which is characterised by vomiting and diarrhoea, is unpleasant



although it is usually short lived and self-limiting. A record number of cases linked to this highly infectious virus were reported in the winter of 2012/13. Only a few virus particles are needed to cause illness. Coupled with the fact that virus particles can survive in the environment, as they tend to be more resistant to physical and chemical treatments than bacteria, this means that outbreaks can be large, particularly in semi-closed environments such as care settings and schools. Scrupulous food and personal hygiene are very important factors to help prevent the spread of infection.

We have been monitoring norovirus since 2005. There are still significant gaps in our knowledge of norovirus in general and, in particular, in relation to the food chain. The relative importance of the different routes of transmission, or how they interact with each other, is not fully understood.

**Figure 6** Laboratory-confirmed cases of norovirus in the UK, 2005 to 2012

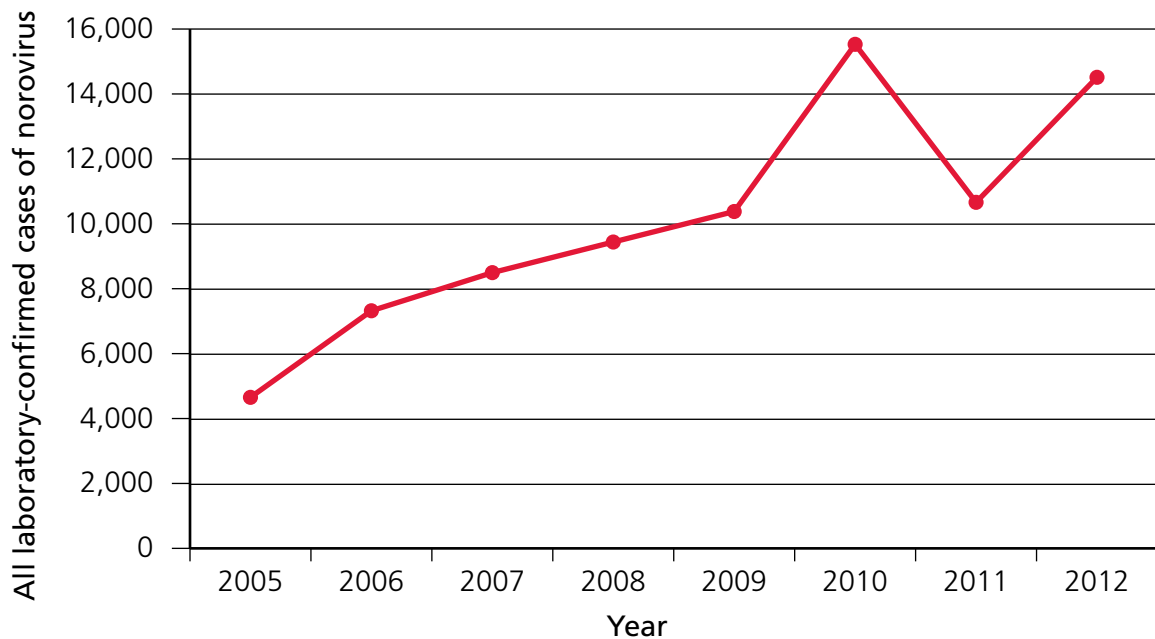


Figure 6 above illustrates the UK incidents rates since 2005. There was an increase in laboratory-confirmed cases over the past year, with 14,513 cases in 2012, compared with 10,661 cases in 2011. Improvements in surveillance by laboratories since we started monitoring norovirus figures may be responsible for some of the observed increases since 2005. In addition, it should be noted that most cases reported in national surveillance are linked to outbreaks in healthcare settings, rather than community cases, and may be less likely to be associated with a foodborne source.

## Foodborne Virus Research Programme

The Agency has a Foodborne Virus Research Programme which aims to provide data to help us to assess whether interventions directed at the food chain are likely to have significant impacts on reducing overall numbers of norovirus cases and where control interventions could be targeted. Following a research call in October 2012<sup>18</sup> we are commissioning research expected to start in autumn 2013. This aims to determine what proportion of UK-acquired norovirus illness is foodborne, the relative contribution of different food commodities to foodborne norovirus infections, as well as the impact of contamination from infected food handlers in the food industry, including in the catering sector.

Current molecular methods to detect norovirus ribonucleic acid (RNA) in samples are unable to differentiate between RNA derived from intact and infectious virus particles, and RNA from damaged or non-infectious particles. This means that it is not possible to directly relate the amount of viral RNA to infectivity in the sample. During the past year we funded a critical review of methods for distinguishing infectious and non-infectious norovirus.<sup>19</sup> Details of the study can be found in Chapter 4. We are also exploring the possibility of funding further research in this area.

The Agency funded a study to develop an initial system dynamics model<sup>d</sup> of the norovirus transmission system.<sup>20</sup> Initial results have been used to assess the relative importance of the different epidemiological transmission mechanisms, and we are now developing the model further.

As part of our research programme in this area, we held a two day research conference on foodborne viruses in London in January 2013. See the text box below.

### In focus

#### Foodborne viruses research conference

More than a 100 delegates from the UK, Europe and internationally, including leading researchers, experts in norovirus and hepatitis (A and E), industry representatives and regulators met to discuss foodborne viruses research.<sup>21</sup>



BACK TO  
CONTENTS

<sup>d</sup> System dynamics is a computer-aided approach to policy analysis and design. It applies to dynamic problems arising in complex social, managerial, economic, or ecological systems – literally any dynamic systems characterised by interdependence, mutual interaction, information feedback, and circular causality.

The aims of the conference were to:

- consider existing scientific knowledge on foodborne norovirus
- identify areas for further research
- discuss measures that can help reduce the number of cases of foodborne viruses caused by contaminated food

There were a series of talks and interactive discussions on the following topics:

### **Understanding norovirus**

The presentations provided an overview of norovirus, the key clinical features, the current status of norovirus virology and diversity in investigating the burden of foodborne illness. Topics covered included: the second study of Infectious Intestinal Disease in the community (IID2 study); and outbreaks in the hospital setting.

### **Norovirus methodology**

There was a presentation on the work conducted to develop a standard reference method for the detection of norovirus and hepatitis A virus in foods. There were also talks on the Agency-funded critical review of methods for detecting human noroviruses and predicting their infectivity<sup>19</sup> (see Chapter 4 for more information on this study), and an ongoing study reviewing the survival of norovirus in foods and on food contact surfaces.<sup>22</sup>

### **Norovirus in the food chain**

Presentations covered all stages of the foodchain and included measures to deal with issues of viruses in fresh produce, shellfish and in food catering premises.

### **Foodborne viruses: international perspective**

Presentations included the work conducted by:

- the USDA – National Institute of Food and Agriculture Food Virology Collaborative project (NoroCORE)
- EFSA on methods, limits and control options available to tackle the issue of foodborne viruses
- the Noronet initiative, which aims to provide a platform for rapid exchange of information and data on norovirus cases and outbreaks, to inform public health action internationally

### **Hepatitis E and A viruses in the foodchain**

Presentations provided an overview of the issues.



### Research gaps

The conference proceedings identified a number of research gaps that require further consideration. These are grouped into the following five areas:

- Surveillance: more research required to determine the prevalence of norovirus at the point of sale and to determine the levels and distribution of norovirus contamination in food handling environments.
- Infection and immunity: research needed to understand dose-response relationships in humans and to determine the infectious dose in different food commodities. Additionally, more research required to better understand how norovirus survives in different food matrices and in different stages of the food chain.
- Detection methods: the research gaps identified focus on the inability of current norovirus detection methods to distinguish between infective and non-infective virus particles; whole genome sequencing for use in detection and characterisation of norovirus; and an attempt to achieve international consensus on appropriate norovirus surrogates.
- Food handlers and social science: research to identify the best strategy to raise awareness and change behaviours of people; to prepare guidance on achieving most effective cleaning and hand washing regimes; and to determine the effectiveness of cleaning regimes on norovirus levels on different surfaces.
- Shellfish and fresh produce: areas identified requiring further research were: to investigate alternative sites for growing of oysters; investigation of innovative and alternative processes to improve the ability to remove norovirus from oysters; and further research into production and harvest practices amongst UK fresh produce growers.

Ideas from the conference will be used to develop objectives within the Foodborne Virus Research Programme, future Agency work in this area and identification of common research interests and priorities where funding bodies can collaborate and adopt a joined up approach.

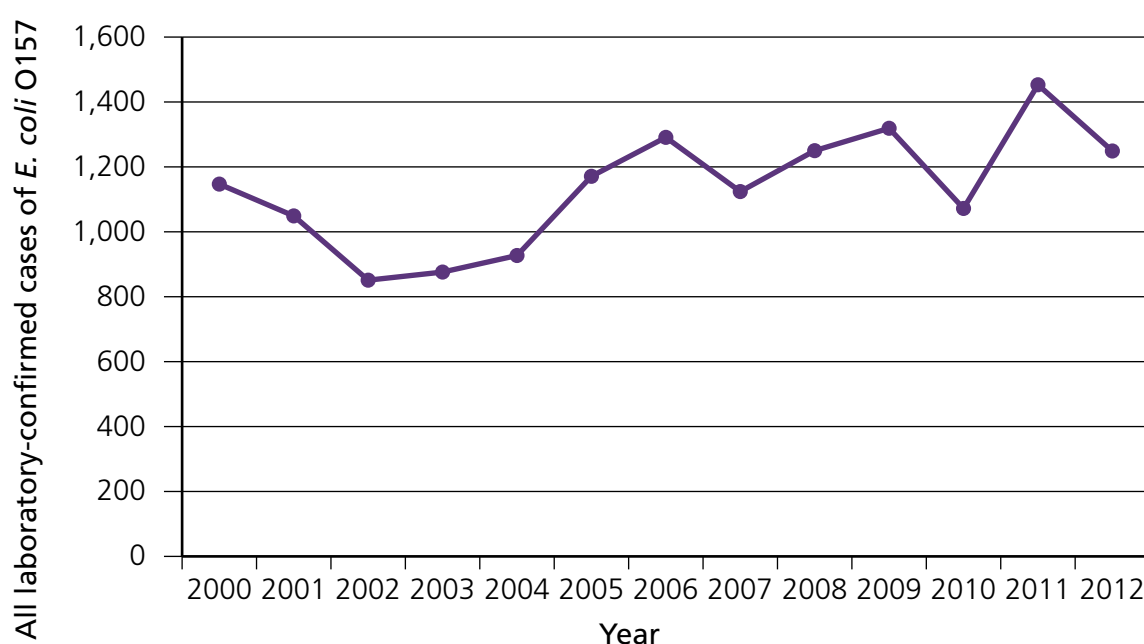
### 1.6 *Escherichia coli*

*Escherichia coli* (*E. coli*) bacteria are commonly found in the human gut, and are part of the normal gut microflora. Most strains of *E. coli* are harmless but some can cause disease and lead to serious infection in humans. The most harmful group is called Verocytotoxin-producing *E. coli* (VTEC), of which the most common strain leading to human illness in the UK is *E. coli* O157. This pathogen can cause bloody diarrhoea, and may lead to the serious conditions haemolytic uraemic syndrome and thrombotic thrombocytopenic purpura, that can be fatal.



*E. coli* O157 can be shed in the faeces of ruminant animals. Humans can be infected through direct contact with faeces or affected animals, the consumption of water from a contaminated water supply, or contaminated food. Foodborne illness has been associated with poor food handling practices such as undercooked burgers, contaminated produce and cross-contamination between raw meat and ready-to-eat food.

**Figure 7** Laboratory-confirmed cases of *E. coli* O157 in the UK, 2000 to 2012



There was a slight decrease in the number of laboratory-confirmed cases of *E. coli* O157 in 2012 with 1,249 cases, compared with 1,453 in 2011. See Figure 7.

### ***E. coli* O157 outbreak**

There was a significant outbreak of *E. coli* O157 in 2012. The Agency worked with the Public Health Agency (PHA)<sup>23</sup> in Northern Ireland, Health Protection Agency (HPA) in England [now Public Health England (PHE)] and environmental health officers from Belfast City Council to investigate an outbreak of *E. coli* O157 linked to a restaurant in Belfast, in October 2012. As of 14 November 2012 there were 140 confirmed cases and 160 presumptive cases.

Following notification of the first possible case, prompt action was taken by the local authority, which resulted in the voluntary closure of the Belfast restaurant in October 2012. Throughout the incident we directed food handlers to advice, via our website, to our guidance on how to prevent the spread of infection through food.<sup>24</sup> In addition, we issued advice to consumers and food handlers, reminding them of the importance of





following good food hygiene practices, and suggested that those who work with food and were suffering from symptoms of food poisoning, to stay away from work and see their GP.<sup>25</sup>

### Tackling poor management of food handling practices

We are funding research to tackle poor management of food handling practices, which can increase the risk of foodborne illness. In the wake of criticism of the inspection regimes, as highlighted in the 2009 Pennington Public Inquiry Report of *the 2005 E. coli* O157 outbreak,<sup>26</sup> we funded a study to explore the various mindsets that authorised officers might adopt in their approach to regulatory procedures. These varied from educator, consultant, and regulator, to enforcer as a last resort. The Agency's Code of Practice sets out instructions and criteria that local authorities should comply with when enforcing food law. The report of the study was published in 2012, and included an evaluation of interventions, and a qualitative review of food safety regulatory decision-making.<sup>27</sup> The results of the study provide us with insights into the decision-making processes which are vital to our food safety regulatory work.

An evaluation of the Agency's detailed cross contamination guidance for industry and local authority enforcement officers<sup>28</sup> was completed in 2012. This has helped us understand how the guidance has been received and used. The findings will be used to enhance the content and delivery of the guidance in the future.<sup>29</sup>

### Tackling *E. coli* O157: on-farm and carcass contamination

We are funding specific research on VTEC, including *E. coli* O157, to tackle the burden of disease from this pathogen. At the start of 2013, we published the results of a short study to evaluate the feasibility of introducing methods to reduce *E. coli* O157 shedding in cattle prior to slaughter in the UK.<sup>30</sup> This work addresses another recommendation in the Pennington Public Inquiry Report, that a means to identify 'supershedder' cattle on farms should be explored as a potential way to reduce the likelihood of spreading the pathogen to other cattle.<sup>26</sup> However, the routine testing of livestock may not be cost-effective or practicable, but measures aimed at reducing shedding in the entire herd prior to slaughter could be easier to administer, and provide a similar level of control. Further details of the Agency-funded study are given in Chapter 4.

The need for further research on the transmission and colonisation of *E. coli* O157 in cattle was highlighted at an international workshop hosted by the Agency in Scotland in 2011.<sup>31</sup> A number of recommendations on the key research gaps were identified and we issued a call for further research in March 2013. This aims to help improve our understanding of the factors which lead to *E. coli* O157 shedding by cattle and to evaluate the impact of intervention strategies for on-farm control.<sup>32</sup>

The use of lactic acid for the surface decontamination of bovine carcasses was authorised by the European Commission in February 2013, following a favourable risk assessment by the European Food Safety Authority (EFSA).<sup>33</sup> This will provide an



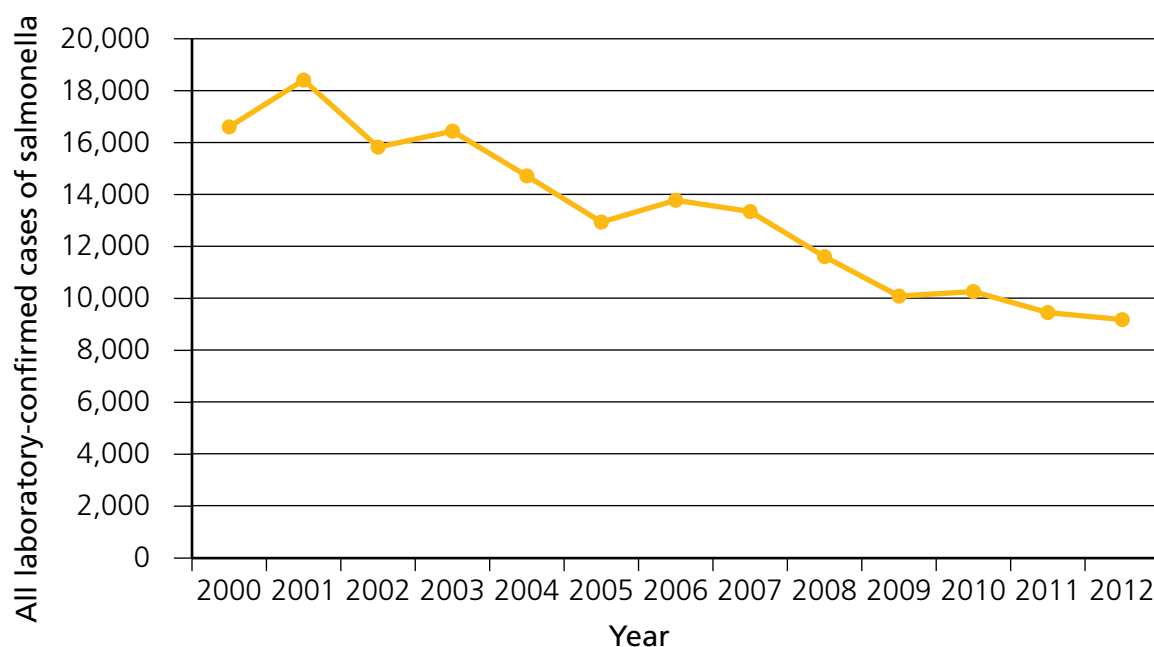
additional tool to help reduce contamination by the pathogens VTEC and salmonella found on the surface of bovine carcasses, but should not be a substitute for good hygienic practices and operating procedures.

## 1.7 Salmonella

Salmonella can cause salmonellosis in humans. Symptoms include watery diarrhoea, stomach cramps and occasionally vomiting and fever. Transmission can occur by eating contaminated food. Salmonella bacteria live in the gut of many farm animals and can affect meat, eggs, poultry, and milk. Other foods like vegetables, fruit and shellfish can become contaminated through contact with manure in the soil or sewage in the water. Salmonella can be spread from person to person by poor hygiene, by failing to wash your hands properly after going to the toilet, or after handling contaminated food.

Cases of salmonellosis in the UK continue to fall since the implementation of a vaccination programme for chickens in the late 1990s and continued improvements to egg and poultry hygiene. There were 9,184 confirmed cases of salmonella across the UK in 2012, compared with 9,456 in 2011. See Figure 8.

**Figure 8** Laboratory-confirmed cases of salmonella in the UK, 2000 to 2012



Although there has been a notable decrease in the number of cases of foodborne salmonellosis since 2000, there are still a large number of cases and a significant number of outbreaks of human disease each year. We will continue to monitor the incidence of salmonella cases and outbreaks to check that the downwards trend in case numbers continues, and we will take further action if the situation worsens.



## 1.8 Reported behaviour associated with food safety risks

The Agency's 'Food and You' survey collects robust information on people's attitudes, reported knowledge and behaviour relating to food. The first wave of the survey was carried out in 2010, and the second wave provides data from 2012. In the second wave of the survey an index of recommended practice associated with reported food safety practices was constructed by combining data from 14 questions on food safety practices into a single composite measure. This index was then analysed to explore the socio-demographic differences in reported food safety practices. Findings from wave 2 of 'Food and You' can be seen in the text box below.<sup>34</sup>

### In focus

#### The 'Food and You' survey findings on food safety practices

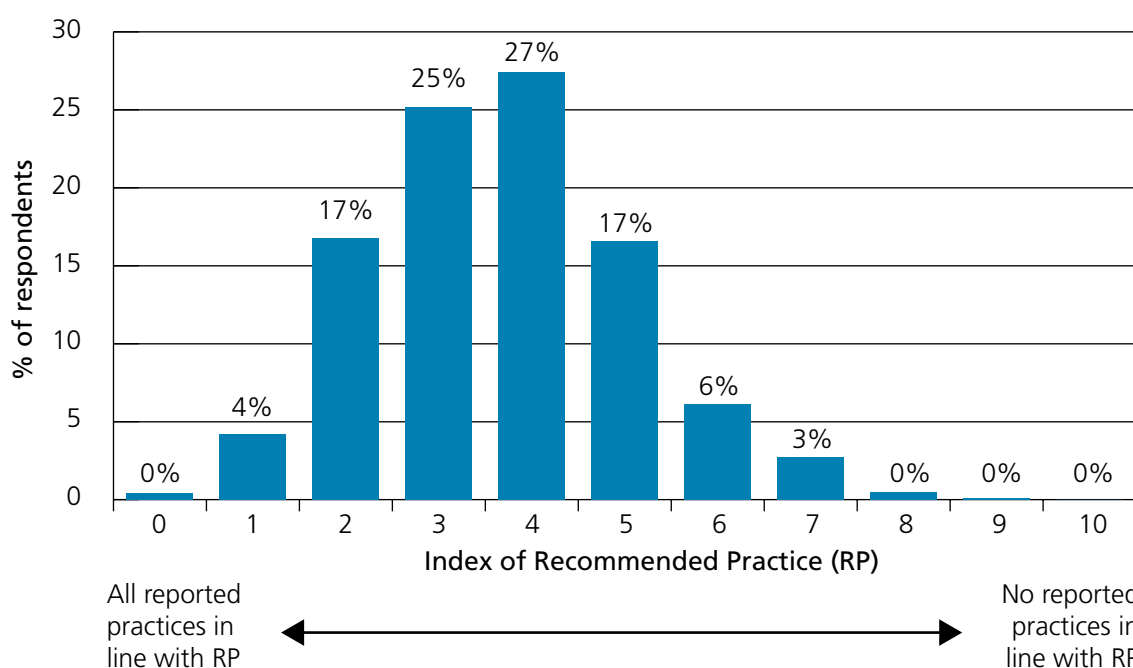
The key findings were:

- the majority of respondents reported more food safety practices that were in line with recommended practice than were not in line and very few respondents reported practices that were all in line, or were all not in line, with recommended food safety practice, as seen in Figure 9.
- older respondents (aged 75+) were more than twice as likely to report food safety practices that were not in line with Agency guidance compared to younger respondents (aged 35 to 44)
- male respondents were 1.5 times as likely to report food safety practices that were not in line with Agency guidance, compared to female respondents
- compared to wave 1, a greater proportion of respondents in wave 2 said that, in line with recommended practice, they never wash raw meat and poultry (32% compared to 26% in wave 1) and that the fridge temperature should be between 0 and 5°C (53% compared to 46% in wave 1)
- only two-thirds (64%) of respondents said that 'use by' dates were the best indicator of whether food was safe to eat, and other commonly reported indicators were how food smells and how it looks
- almost three-quarters (72%) of respondents reported being concerned about food poisoning, and more than two-thirds (69%) said that cleanliness and hygiene was a consideration when deciding where to eat out



- a third (34%) of respondents in England, Wales and Northern Ireland reported previously having seen a Food Hygiene Rating Scheme (FHRS) certificate and/or sticker, and 44% of respondents in Scotland reported having seen a Food Hygiene Information Scheme (FHIS) sticker and/or certificate

**Figure 9** Index of recommended practice – percentage of respondents in each category



'Food and You' provides robust quantitative data representative of the UK. However, it is limited to collecting self-reported knowledge and behaviour, and does not explore why respondents undertake certain practices. The Agency is therefore drawing together its knowledge base on both self-reported and observed UK domestic food safety practices. This will provide us with a richer understanding of how to improve public knowledge and awareness of food hygiene and foodborne illness.

### 1.9 New tools to investigate foodborne outbreaks

We are keen to exploit the potential of molecular biology tools in our work, such as next generation sequencing, to reduce foodborne disease. We organised a successful workshop in 2012, in partnership with the Health Protection Agency (HPA) [now Public Health England (PHE)], Health Protection Scotland, the Biotechnology and Biological Sciences Research Council (BBSRC) and the Advisory Committee on the Microbiological Safety of Food (ACMSF), on the application of molecular epidemiology to investigations of foodborne disease outbreaks.<sup>35</sup>

The devastating effects of incidents such as the 2011 *E. coli* O104 outbreak in Germany, remind us of the need to transform the way we investigate incidents in the future, and to embrace cutting-edge technology to help us. Professor Sarah O'Brien, Chair of the ACMSF, in her key note speech at the launch of the Agency's Annual Report of the Chief Scientist 2011/12 acknowledged that there are technical and organisational challenges that would need to be overcome before these new methods could be introduced.<sup>36</sup> Further work in this area will help us to understand the sources of food poisoning and how it can spread. We are investigating the use of next generation sequencing approaches where appropriate in the work we are funding.

Working in partnership will help us foster and support the implementation of modern food safety practices. We have established good links with the United States Food and Drug Administration (FDA), which is also investigating the application of whole genome sequencing to provide faster identification of new and emerging hazards. We are participating in a major international initiative on next generation sequencing called Global Microbial Identifier (GMI), which aims to develop a co-ordinated approach to its use for public health and clinical disease cluster detection on a global scale.<sup>37</sup> The aim of the most recent meeting held in February 2013 was to develop a plan for the next few years. Five working groups have already been set up, which cover issues such as governance/ownership, dealing with data, infrastructure and possible pilot projects. The Agency is part of the steering committee which is developing a governance structure and a communications strategy.

Another related initiative in the United States that we have been finding out about is the 100K Foodborne Pathogen Genome project.<sup>38</sup> This will sequence 100,000 genomes of important pathogens with a view to facilitating tracking of foodborne illness to its source.

## Chapter 2: Nutrition, diet and health

### Diet and nutrition

Responsibility for nutrition in England transferred to the Department of Health (DH)<sup>39</sup> and in Wales to the Welsh Government<sup>40</sup> in October 2010. Within DH, part of nutrition is now handled by its executive agency Public Health England (PHE). Nutrition policy (including legislation, folic acid policy, nutrition elements of the Public Health Responsibility Deal<sup>41</sup> etc.) remains in DH. Nutrition science (including nutrition surveys, the Scientific Advisory Committee on Nutrition and nutrition advice) transferred to PHE when it came into being on 1 April 2013. We continue to advise and support Ministers in Northern Ireland and Scotland on nutrition policy. However, in June 2012, the Scottish Government announced that it will create a new Scottish body for food safety, food standards, nutrition, food labelling and meat inspection.<sup>42</sup> This will require primary legislation and until any alternative legislative amendments come into force, our activities in these areas will continue in Scotland.

We work across government with the food and drink industry, consumers and other health organisations to develop the evidence base necessary to deliver our Strategic Plan outcomes relating to dietary health in Northern Ireland and Scotland. We continue to fund science and evidence-gathering work related to diet and health to support our responsibilities in those countries. One of our key priorities in Scotland and Northern Ireland is to work with relevant organisations to improve public awareness and use of messages about healthy eating.

In Scotland the Agency supports the Scottish Government's National Food and Drink Policy, and their route map towards healthy weight, 'Preventing Overweight and Obesity in Scotland'.<sup>43</sup> Our aim is to help improve diet and to provide effective support and expert nutrition advice to ensure consistent messages on all aspects of food policy, including production and catering.



In Northern Ireland we work in partnership with the Department of Health, Social Services and Public Safety, and other relevant organisations, to assist the implementation of the integrated outcomes in the report, 'A Fitter Future for All – Framework for Preventing and Addressing Overweight and Obesity in Northern Ireland 2012-2022'.<sup>44</sup> The aim is to improve public awareness, and to use messages about healthy eating, to encourage the food industry to continue to achieve reductions in levels of saturated fat, salt and calories in food products, and to ensure that portion sizes appropriate for a healthy diet are available and promoted.

## 2.1 Supporting a healthy lifestyle

Previous Agency-funded research revealed that there is a lack of public knowledge of the recommended calorie intake for maintaining a healthy weight.<sup>45</sup> In April 2012, we launched a pilot scheme called Caloriewise in Northern Ireland, in which local food businesses displayed calorie information on their menus from 1 May to 31 October 2012. The aim of the scheme is to encourage consumers to make more informed choices when eating out.<sup>46</sup> The pilot is being evaluated to consider the practical issues for businesses, as well as to gauge consumers' reactions and their understanding of the scheme. Results will be available later in 2013.

Previous Agency-funded research has investigated ways to support young people and the wider school community, to make and sustain lifestyle changes that contribute positively on their health and well-being.<sup>47</sup> Building on the recommendations from this research, the Agency in Northern Ireland has been working with Sport Northern Ireland on the Activ8 Eatwell Programme to help us reach the target audience. Activ8 Eatwell is a complete package of teaching tools linked to the Northern Ireland curriculum, aimed at primary school-aged children, to enable them to lead active and healthy lifestyles by developing their understanding and appreciation of physical activity and healthy eating.<sup>48</sup>

## 2.2 An update on front-of-pack labelling

Since 2010, Defra and the Department of Health (DH) have led on general food labelling and nutrition labelling respectively and they have the policy lead for most of the provisions in England. In Scotland, Northern Ireland and Wales (except for nutrition labelling for which the Welsh Government has responsibility), the Agency retains the policy lead on behalf of Ministers in those countries. The Agency also retains the policy lead for food safety labelling in England.

Governments across the UK are committed to the provision of nutritional information to help consumers make better informed food choice, to help them improve their health, guard against risks such as obesity, and conditions such as high blood pressure, heart disease, and diabetes. In December 2012, the Board was updated on progress towards developing a consistent front-of-pack labelling scheme for consumers, in consultation with the food industry across the UK.<sup>49</sup>

Following Agency-funded consumer research, the Agency's Board recommended a hybrid front-of-pack nutrition labelling scheme in March 2010.<sup>50</sup> This comprised traffic light colours and/or high-medium-low indicators plus 'percentage guideline daily amounts' for four key nutrients: fat, saturated fat, salt and sugar.

The new European Food Information to Consumers Regulation contains a voluntary provision for front-of-pack labelling.<sup>51</sup> A full stakeholder consultation on front-of-pack labelling was launched in each of the four countries in May 2012. The Board noted the positive partnership working between the Agency and government departments in England and Wales to reach a consensus view across the UK, at the December 2012 meeting.<sup>49</sup> In March 2013, the Board agreed proposals on a front-of-pack labelling scheme which were submitted for Ministerial agreement across the UK.<sup>52</sup> New front-of-pack label criteria have now been launched across the UK.<sup>53</sup>

### 2.3 Monitoring progress towards dietary targets

The Agency-funded survey of diet among children in Scotland (2010) was published in October 2012.<sup>54</sup> The survey was conducted as a follow up on previous work to monitor progress towards the Scottish Dietary Target for added sugar intake in children.<sup>55</sup> The 2010 results show that children are still consuming too much added sugar, although the amount has decreased since the 2006 survey.<sup>56</sup> Mean intakes of saturated fats were also above recommended levels and similar to those found in the 2006 survey. The survey also considered children's school day purchasing habits and found that 63% of children purchased food or drinks at lunchtime. Items commonly purchased were confectionery, sugar-sweetened drinks, crisps and water. Further information about this study can be found in Chapter 4.

The Agency in Scotland is currently funding a project to develop a computerised 24-hour recall tool to assess dietary intake.<sup>57</sup> This should provide a cost effective means of obtaining robust dietary data from a large number of participants. The system will be initially developed for 11 to 24-year olds, but once developed it may be applied to other age groups. It is envisaged that the new online dietary assessment tool would be used for future surveys of dietary intakes of children and young people in Scotland.

We held a dissemination event in spring 2013 to highlight the outputs from the nutrition work and surveillance projects we fund in Scotland. This provided an opportunity to promote the new *eatwell everyday* website<sup>58</sup> designed to assist consumers to achieve healthy eating. There was also an opportunity to gauge views regarding our work and potential future research ideas.



## 2.4 National Diet and Nutrition Survey

The National Diet and Nutrition Survey (NDNS) is funded and managed by the Department of Health in England (this work transferred to Public Health England on 1 April 2013), with a contribution to funding from the Agency. It provides detailed quantitative information on food consumption, nutrient intakes, nutritional status and related characteristics in the general population. The results inform work on diet and health in Scotland and Northern Ireland. The results also provide the Agency with detailed consumption data needed for food chemical exposure assessments and hence risk assessments to help protect consumer safety.

The current NDNS contract covers five years fieldwork from 2008 to 2013. The combined results from years one to three of the rolling programme (2008/09 to 2010/11) were published in July 2012. See the text box below.

### In focus

#### National Diet and Nutrition Survey years one to three

The National Diet and Nutrition Survey (NDNS) began in 1992 and since 2008 it has been a rolling programme. This continuous cross-sectional survey is designed to assess the diet, nutrient intake and nutritional status of a representative sample of around 500 adults and 500 children per year from the general population aged 18 months upwards living in private households in the UK. It includes an interview, a four-day dietary diary as well as blood and urine samples.



The latest report, with the combined findings from years one to three, does not indicate any new areas of concern in the nutritional status of the general population.<sup>59</sup> However, it suggests that the overall picture of the diet and nutrition of the UK population is not improving. Findings are broadly similar to previous surveys in the NDNS series carried out between 1994 and 2001.

#### Fruit and vegetables

- Adults aged 19 to 64 years consumed on average 4.1 portions per day and adults aged 65 years and over consumed 4.4 portions. 31% of adults and 37% of older adults met the '5-a-day' recommendation.



- For children aged 11 to 18 years, boys and girls consumed on average 3.0 and 2.8 portions per day respectively. 11% of boys and 8% of girls in this age group met the '5-a-day' recommendation.

### Oily fish

- Mean consumption of oily fish was well below the recommended one portion (140g) per week in all age groups. For example, mean consumption in adults aged 19 to 64 years was equivalent to 54g per week.

### Total fat

- Mean total fat intake met the recommendation of no more than 35% food energy in all age/sex groups except for men and women aged 65 years and over, for whom, on average, total fat provided 36.9% and 35.4% food energy respectively.

### Saturated fat

- Mean intakes in all age groups exceeded the recommended level of no more than 11% food energy. For example, mean saturated fat intake for adults aged 19 to 64 years was 12.7% food energy.

### Trans fat

- Mean intakes provided 0.7% of food energy for children and adults aged 19 to 64 years and 0.8% food energy in older adults aged 65 years and over, thus meeting the recommendation of no more than 2% food energy.

### Non-Milk Extrinsic Sugars (NMES)

- Mean intakes exceeded the recommendation of no more than 11% food energy for all age groups, most notably for children aged 11 to 18 years where mean intakes provided 15.3% food energy.

### Alcohol

- 58% of adults aged 19 to 64 years and 52% of adults aged 65 years and over consumed alcohol during the four-day diary. Adults aged 19 to 64 years who consumed alcohol, obtained 9% of energy intake from alcohol, and older adult consumers obtained 7%.

### Iron

- Mean iron intakes were below the recommendation for girls aged 11 to 18 years and women aged 19 to 64 years and 46% of girls and 23% of women had low intakes. There was evidence of both iron-deficiency anaemia (as indicated by low haemoglobin levels) and low iron stores (plasma ferritin) in 5.6% of girls and 3.3% of women.



### Vitamin D

- There was evidence of low vitamin D status (as indicated by low plasma 25-hydroxyvitamin D (25-OHD) concentrations) in all age groups reported, 18% of adults aged 19 to 64 years and 20% of children aged 11 to 18 years. This has implications for bone health including increased risk of rickets and osteomalacia (soft bones).

### Blood lipids

- Nearly half of adults had elevated concentrations of serum total cholesterol associated with increasing risk of cardiovascular disease. This is in line with findings from health surveys.

A UK NDNS report, combining data from the first four years of the rolling programme (2008/09 to 2011/12), is being prepared for publication in autumn 2013. This will be more comprehensive than previous reports and will contain some new analyses including a comparison of intakes between years one and two, and years three and four. Fieldwork for year five of the rolling programme (2012/13) was carried out in the past year.

The Agency funded a sample boost to the NDNS in Scotland, Wales and Northern Ireland in 2012, to collect individual data on the nutritional intake and nutritional status of adults and children. Separate reports for four years of boosted samples in each country will follow in 2014/15.

Following a competitive tendering process, a contract for a further four years of NDNS (2013 to 2017) has been awarded to a consortium led by NatCen Social Research, with fieldwork beginning in April 2013. The survey content is largely unchanged, except that a spot urine sample will be collected for iodine analysis and 24-hour urine samples for sodium analysis will be collected separately. Reporting will be biennial with the UK report of years five to six fieldwork due for publication in 2015.

## 2.5 Diet and Nutrition Survey of Infants and Young Children

The Agency co-funded the Diet and Nutrition Survey of Infants and Young Children (DNSIYC), to collect detailed individual data on the nutritional intake of infants and young children.<sup>60</sup> The Agency in Scotland and the Scottish Government funded an additional boost, to provide detailed representative dietary intake data from over 600 infants. Findings from the survey were published in March 2013. See the text box on the next page.

## In focus

### Diet and Nutrition Survey of Infants and Young Children in Scotland

The Diet and Nutrition Survey of Infants and Young Children in Scotland (DNSIYCS) report provides the only source of high quality nationally representative detailed information on food consumption and nutrient intakes of infants and young children aged 4 to 18 months living in private households in Scotland.<sup>61</sup>



The fieldwork took place between January and May 2011 and covered a sample of 616 children between the ages of 4 and 18 months. Components of the survey included: a detailed face-to-face interview collecting background information on family circumstances and behaviours, a 4-day food diary and physical measurements of the mother and child.

Findings included:

#### Breastfeeding

- Breastfeeding rates were low and did not meet the recommendations of exclusive breastfeeding for the first six months. The proportion of children who had ever been breastfed was lower in Scotland than across the UK.

#### Preparation of infant formula

- The majority of parents using infant formula in the home followed recommendations for preparation, but did not follow recommendations when feeding outside of the home. These results were similar across the UK.

#### Food intake

- The majority of children were given food other than milk before six months of age, and were therefore not in compliance with the recommendation to delay the introduction of solids to six months.
- Mean total fruit and vegetable consumption was relatively high, ranging from one adult portion per day for children aged 4 to 6 months, to two adult portions per day for those aged 12 to 18 months.



### Nutrient intake

- Intakes of energy, added sugars, protein, fat, carbohydrate, non-starch polysaccharides and most key vitamins and minerals were similar across the UK.
- For the majority of the survey population, mean daily intakes of energy, protein, vitamins and minerals were above or close to the recommendations for all age groups.
- Only 6% to 9% of children were given a micronutrient supplement, most often a multi-vitamin supplement.
- Mean daily intakes of sodium were low for children aged 4 to 6 months, but children aged 12 to 18 months consumed around 2.5g salt per day exceeding the population goal for this age group of no more than 2g salt per day.

Infants and young children aged 4 to 18 months in the survey generally consumed a varied diet and dietary recommendations were generally met by the majority of the population. The report does not identify any new nutritional problems in this age group. The age at which exclusive breastfeeding typically ceases and complementary foods are typically introduced is earlier than recommended.

## 2.6 Salt intakes

A report on dietary sodium intakes was published in June 2012.<sup>62</sup> Intakes are based on an assessment of the sodium content of urine samples collected from July to December 2011 from a representative sample of 547 adults. The samples were generated from the NDNS rolling programme, with additional samples generated via a 'sodium boost' add-on study, so that the sample size was representative of the population aged 19 to 64 living in England, and sufficient to detect a difference of 0.5g of salt intake compared with the previous UK survey in 2008 (calculated from the standard error in that survey). The mean estimated salt intake for adults aged 19 to 64 years was 8.1g per day, with a mean estimated intake of 9.3g per day for men, and 6.8g per day for women. Although this suggests a decrease in the nation's salt intake, 70% of all participants still had a daily intake of salt higher than the recommendation of no more than 6g per day.

The Agency's Board previously noted its support for the current industry targets for salt reduction on 80 food categories to be achieved by 2012.<sup>63</sup> A report of an Agency-funded project to monitor progress in Scotland against our salt targets was published in 2013.<sup>64</sup> The results based on market research data, suggest that many supermarket own-brand products, including bread and rolls, cheddar cheese, sausages, cooking sauces and breakfast cereals, have met the current salt targets. However, there is considerable scope across the food industry for further reductions to be made in salt levels in a wide range of processed foods. The Agency in Scotland and Northern Ireland is working with officials across government, industry and other interest groups, to



develop the next steps to achieve further salt reduction in food beyond 2012. Until then the current targets will remain in place across the UK.

## Adverse reactions to food

Following the machinery of Government changes in 2010, in England, general food labelling policy responsibilities were transferred to Defra. The Agency retained responsibility for food allergy and intolerance policy in the UK (including food allergy labelling).

Food allergy and food intolerance are adverse reactions to food that are reproducible and take place every time contact is made with a particular food or food ingredient. Both conditions can make someone feel unwell and can significantly affect their longer term health and wellbeing. In the most serious cases food allergy can cause anaphylaxis, which is severe and potentially life-threatening.

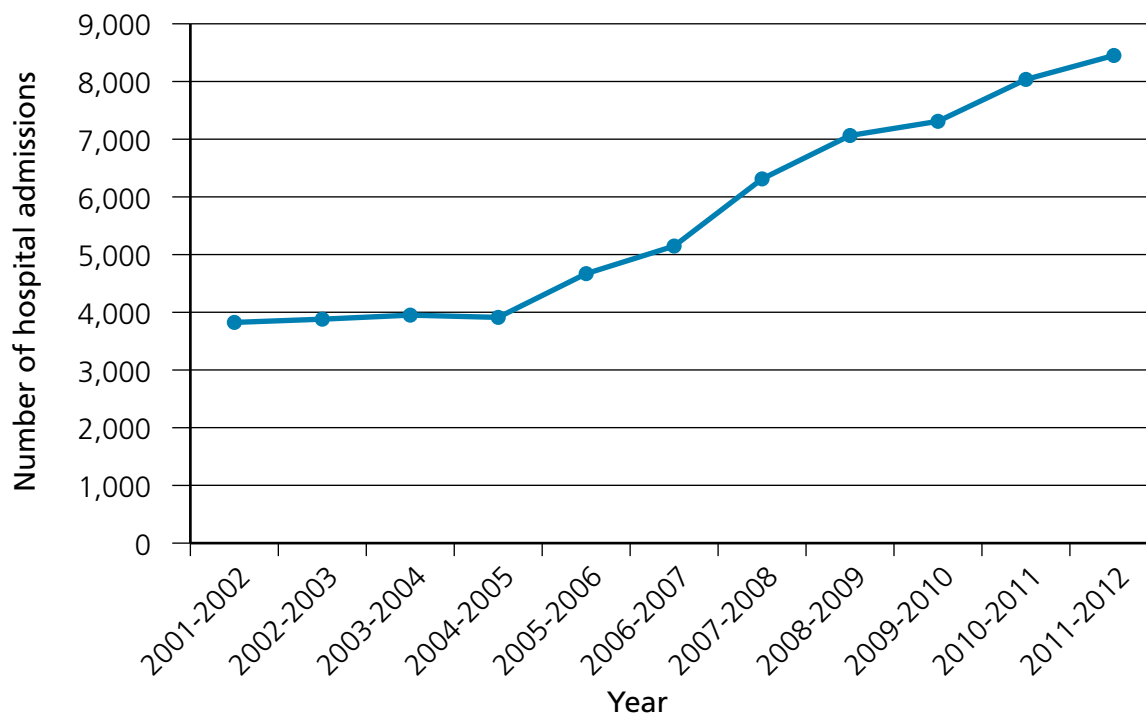
There are important differences between food allergy and food intolerance, for example:

- food allergy is an immediate and potentially life-threatening reaction that occurs when the body's immune system comes into contact with specific proteins found in food
- food intolerance generally does not involve the immune system (with the exception of coeliac disease)
- although the symptoms of a food intolerance can be similar to those of a food allergy, they are generally not as severe or immediately life threatening as a food allergic reaction

### 2.7 Trends in food allergy and intolerance

Current UK data suggests that hospitalisation due to food intolerance and food allergy has been increasing. See Figures 10 and 11.

It should be noted that the vast majority of reactions due to either food intolerance or food allergy do not require hospitalisation and as a result the true number of cases is likely to be significantly higher.

**Figure 10** Trends in hospital admissions due to food intolerance in the UK<sup>e</sup>

Many of UK food intolerance cases requiring hospitalisation are attributable to coeliac disease, see Table 2 on the next page. Coeliac disease is an autoimmune condition, in which gluten (found in wheat, rye and barley) triggers an immune reaction, which damages the lining of the small intestine. This disrupts the body's ability to absorb nutrients from food. Coeliac disease is a common condition that affects approximately 1 in every 100 people in the UK. However, this may be an underestimate as cases may go undiagnosed or misdiagnosed as other digestive conditions.

There has been a steady increase in the number of hospital admissions due to food intolerance since 2005. Although there is no definitive explanation for this, it is possibly due to:

- better diagnosis of conditions, particularly coeliac disease
- increased awareness of conditions and possible symptoms by health professionals
- increased awareness and understanding of conditions by individuals with the disease

<sup>e</sup> Source: Hospital Episode Statistics (data for England), Patient Episode Database for Wales (PEDW) Statistics (data for Wales), Hospital Inpatient System (data for Northern Ireland) and Scottish Clinical Indicators: Scottish Morbidity Record data (data for Scotland). Scottish statistics are derived from data collected on inpatient and day case discharges from non-obstetric and non-psychiatric hospitals (SMR01) in Scotland. It should be noted that the majority of data from 2001 to 2007 reflects food intolerance due to coeliac disease. Data supplied for 2011 to 2012 are provisional.

The Royal College of Physicians' publication 'Allergy the unmet need – a blueprint for better patient care' (2003)<sup>65</sup> and the introduction of the allergen labelling legislation (Directive 2003/89/EC)<sup>66</sup> in November 2005, may have increased awareness amongst both health professionals and consumers.

**Table 2** Detailed annual breakdown of hospital admissions due to food intolerance in the UK<sup>f</sup>

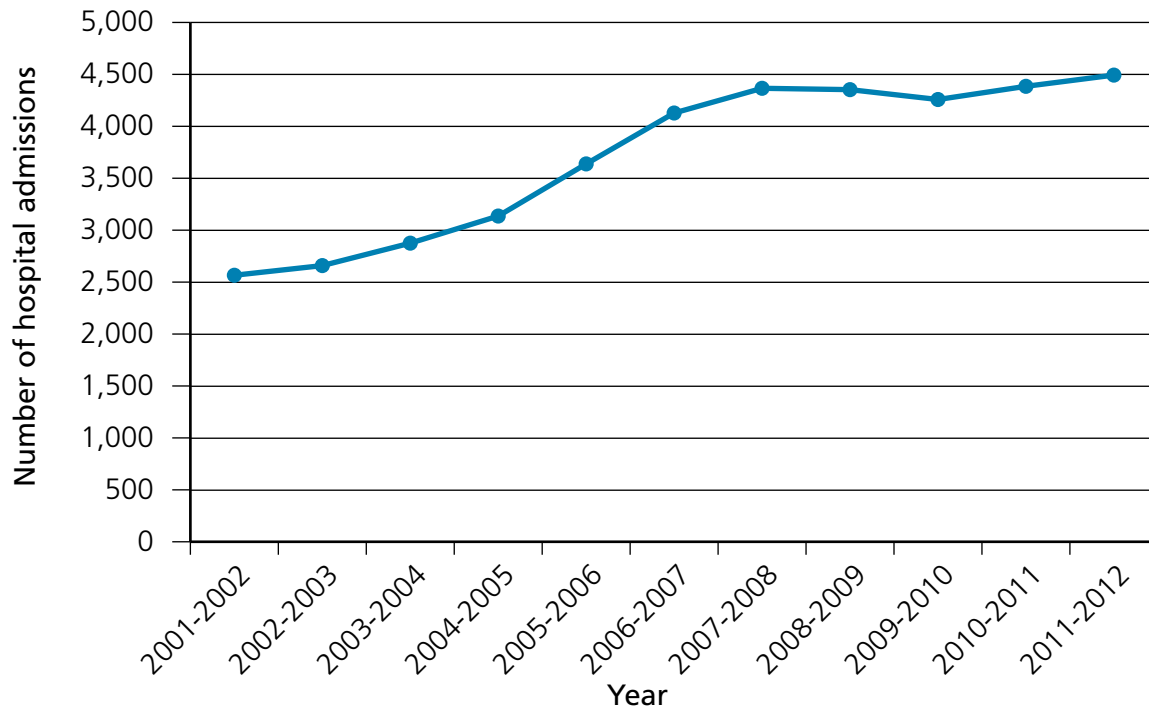
Year	Coeliac disease	Malabsorption due to intolerance, not classified elsewhere	Congenital lactase deficiency	Secondary lactase deficiency	Other lactose intolerance	Lactose intolerance, unspecified	Number of hospital admissions
2001-2002	3,724	53	1	1	2	44	3,825
2002-2003	3,769	61	0	0	3	48	3,881
2003-2004	3,820	70	0	1	3	57	3,951
2004-2005	3,819	55	0	1	0	37	3,912
2005-2006	4,555	63	0	1	9	42	4,670
2006-2007	5,008	87	0	1	6	46	5,148
2007-2008	5,213	762	7	17	29	284	6,312
2008-2009	5,890	827	5	16	22	304	7,064
2009-2010	5,990	869	2	11	22	416	7,310
2010-2011	6,354	1,267	2	10	27	376	8,036
2011-2012	6,534	1,425	8	8	35	441	8,451

Figure 11 on the next page shows that the number of hospital admissions in the UK due to food allergic reactions, has also continued to rise in the past year. As with the food intolerance trends, this is likely to be due to better diagnosis of conditions and more awareness of symptoms and conditions by health professionals and consumers.

Many food allergic reactions are treated in accident and emergency or are self-managed (with patients not being hospitalised) and are therefore not included in these statistics. In addition, hospitalisation figures do not include asthmatic reactions thought to be induced by food allergic reactions. So the true burden of food allergy is estimated to be significantly higher than the hospitalisation figures might otherwise suggest.

<sup>f</sup> Source: Hospital Episode Statistics (data for England), Patient Episode Database for Wales (PEDW) Statistics (data for Wales), Hospital Inpatient System (data for Northern Ireland) and Scottish Clinical Indicators: Scottish Morbidity Record data (data for Scotland). Scottish statistics are derived from data collected on inpatient and day case discharges from non-obstetric and non-psychiatric hospitals (SMR01) in Scotland. It should be noted that the majority of data from 2001 to 2007 reflects food intolerance due to coeliac disease. Data supplied for 2011 to 2012 are provisional.



**Figure 11** Trends in hospital admissions due to food allergy in the UK<sup>g</sup>

Individuals admitted to hospital because of a food allergy are likely to have had a severe reaction known as anaphylaxis. See Table 3 on the next page. An anaphylactic reaction, which can be caused by minute quantities of an allergen, is potentially life-threatening, and can affect many of the systems of the body. Reactions are caused by the sudden release of chemical substances, including histamine, from cells in the blood and tissues where they are stored. The release is triggered by the reaction between the allergic antibody IgE and the allergen. The released chemicals act on blood vessels to cause problems involving the airways and/or circulation and in most cases there will be changes to the skin.

<sup>g</sup> Source: Hospital Episode Statistics (data for England), Patient Episode Database for Wales (PEDW) Statistics (data for Wales), Hospital Inpatient System (data for Northern Ireland) and Scottish Clinical Indicators: Scottish Morbidity Record data (data for Scotland). Scottish statistics are derived from data collected on inpatient and day case discharges from non-obstetric and non-psychiatric hospitals (SMR01) in Scotland. Data supplied for 2011 to 2012 are provisional.

**Table 3** Detailed annual breakdown of hospital admissions due to allergic reactions to food in the UK<sup>h</sup>

Year	Allergic contact dermatitis due to food in contact with skin	Irritant contact dermatitis due to food in contact with skin	Dermatitis due to ingested food	Anaphylactic shock due to adverse food reaction	Other adverse food reactions, not classified elsewhere	Number of hospital admissions
2001-2002	32	1	138	763	1,632	2,566
2002-2003	36	3	188	847	1,585	2,659
2003-2004	59	1	195	879	1,741	2,875
2004-2005	67	0	240	998	1,831	3,136
2005-2006	50	1	265	1,173	2,149	3,638
2006-2007	64	0	266	1,265	2,533	4,128
2007-2008	48	0	274	1,343	2,701	4,366
2008-2009	75	10	283	1,300	2,685	4,353
2009-2010	74	2	273	1,361	2,548	4,258
2010-2011	93	2	334	1,419	2,537	4,385
2011-2012	90	5	396	1,459	2,543	4,493

## 2.8 Food Allergy and Intolerance Research Programme

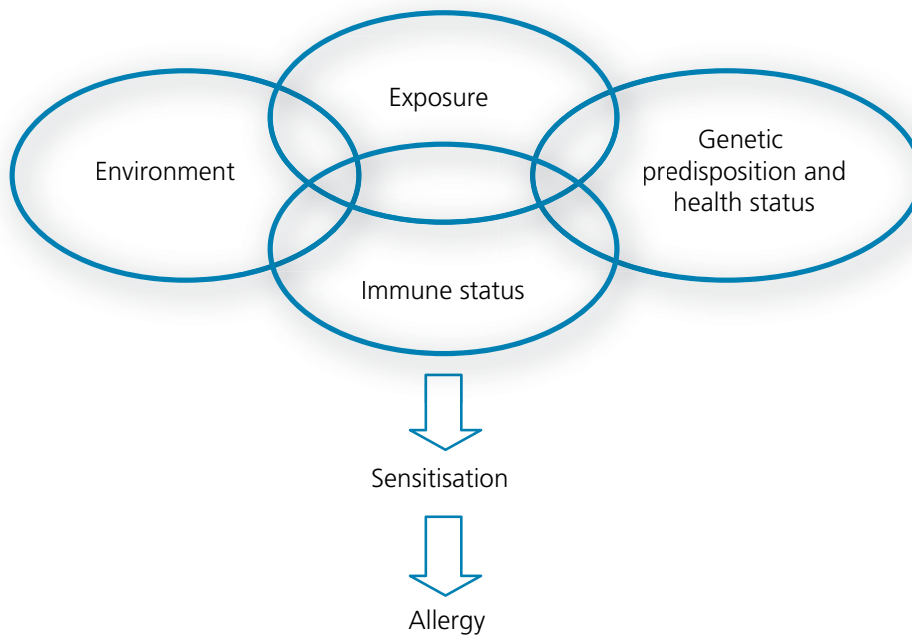
The Agency funds science and evidence-gathering work to investigate the causes and mechanisms underlying food allergy and intolerance. Since 2008 the Food Allergy and Intolerance Research Programme has focused its work on the following four key areas relevant to the Agency's policy needs, where there are major gaps in scientific knowledge.

### Route and timing of exposure to food allergy in early life

This work builds upon previous research undertaken by the programme which investigated how early life environment and particularly dietary and non-dietary exposures to allergenic foods, might influence the development of sensitisation to food proteins. This research will help us to more effectively identify those at risk of developing food allergy and will inform strategies for consumers to reduce their risk of developing allergies.

<sup>h</sup> Source: Hospital Episode Statistics (data for England), Patient Episode Database for Wales (PEDW) Statistics (data for Wales), Hospital Inpatient System (data for Northern Ireland) and Scottish Clinical Indicators: Scottish Morbidity Record data (data for Scotland). Scottish statistics are derived from data collected on inpatient and day case discharges from non-obstetric and non-psychiatric hospitals (SMR01) in Scotland. Data supplied for 2011 to 2012 are provisional.

**Figure 12** Influences on the development of sensitisation to food allergens



### Development of management thresholds for allergenic foods

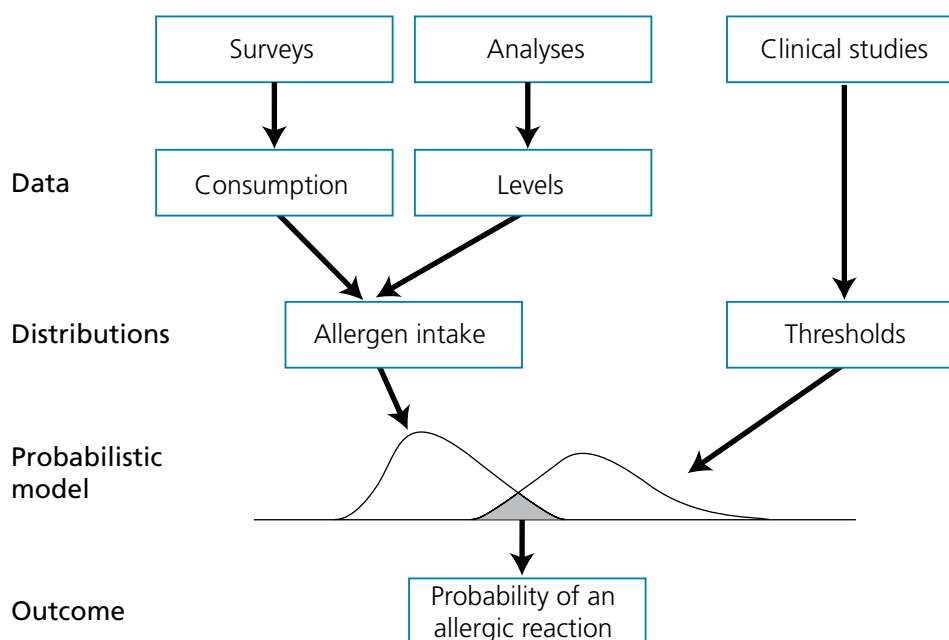
The avoidance of a food allergen is currently the only way to manage a food allergy. In order to help consumers avoid foods they are allergic to, manufacturers are required by law to label the presence of any of the 14 specified allergenic foods, whenever they are used as ingredients in pre-packed foods, regardless of their level of use. However, allergens can be present in foods due to cross contact; this can happen as a result of shared equipment and lines during the manufacturing process or during storage or transport. At present there are no internationally agreed limits for the unintentional presence of allergens in pre-packed food.

This important area of work aims to facilitate the development of allergen management thresholds or action levels. If the food industry could be sure that there was a measurable level below which people would not react, this could be used by industry and regulators to guide decisions about the likely risk of allergen cross-contamination in processed food and the need for 'may contain' labelling. Such levels could inform risk assessments, allergen management and risk communication strategies. It is proposed that management threshold levels could be established through the use of probabilistic risk assessment, where the risk of an allergic reaction is estimated based on information about allergen intake and clinical thresholds.

There is more information about Agency-funded work on threshold levels of allergens in Chapter 4.



**Figure 13** Probabilistic risk assessment – simplified illustration of the idea



## Prevalence and characteristics of food allergy and intolerance

This work seeks to establish the prevalence of food allergy (including food sensitisation) and intolerance in the UK population. The focus of research in recent years has been to establish the point prevalence and prevalence over time of total food allergy and allergy to individual foods predominately in infants and children. Work within the programme has also focused on characterising the clinical symptoms associated with food allergy, particularly with emerging allergens such as kiwi.

## Food allergen labelling and consumer choice

This programme of work aims to provide a better understanding into the needs of the food allergic and intolerant consumer and the factors that influence their decisions when buying food. The work should also help us understand how to communicate changes in food allergen labelling legislation to consumers and health professionals. In recent years this work has focused on changes to 'gluten-free' legislation. Future research is likely to focus on the information required to implement the EU Food Information to Consumers Regulation<sup>51</sup> which will come into force in December 2014.

We regularly undertake reviews of our research programmes to assess the success and productivity of the programme, and of the individual projects within it. In November 2012, we organised an independent review of our Food Allergy and Intolerance Research Programme.<sup>67</sup> See the text box on the next page. Projects were evaluated in terms of their scientific quality, relevance to our policy needs, and value for money, to

determine whether the projects have addressed the aims and objectives of the programme.

## In focus

### Food Allergy and Intolerance Research Programme review

The purpose of the review was to evaluate the projects that have collectively made up the programme since it was last reviewed in 2008.<sup>68</sup> Projects were assessed for their productivity and success in terms of scientific quality, impact on policy and the overall value for money of the research programme under which the majority of the projects were commissioned. In addition, the review considered the future direction of the programme and sought to identify, in conjunction with interested parties, possible priority areas for Agency funding for the next five years.



The review panel considered that the scientific quality of the research programme since the last review had been high. The panel was of the view also that the programme as a whole had been very productive and delivered relevant science in a number of important areas.

The recommendations for future research were categorised into key areas outlined below. The following areas of research were considered to be of particular interest to the Agency over the next five years.

#### Provision of information and advice to consumers and industry

At the end of 2014, the EU Food Information to Consumers Regulation 1169/2011 will be introduced.<sup>51</sup> It will require food businesses to provide allergy information on food sold unpackaged, in for example, catering outlets, deli counters, bakeries and sandwich bars. There will also be changes to existing legislation on labelling of allergenic ingredients in pre-packed foods with a requirement to highlight the allergenic ingredients using colour, bold font, etc. It was agreed that research should focus on how best to communicate these changes to key stakeholders. ➔

### **Importance of route and timing of exposure to food allergens**

It was acknowledged that if the Agency is to make a significant contribution in identifying risk factors associated with the development of sensitisation and food allergy, this work should continue to be a focus over the next five years. Research should also be undertaken to establish whether long term tolerance has been achieved, and whether such tolerance is allergen or disease specific.

### **Adult food allergy**

The panel considered that the Agency should undertake a review of adult food allergy, which could include research to establish the prevalence and characteristics of food allergy in adults. Research could be undertaken to understand why people develop food allergies later in life, what routes of exposure are relevant, and why individuals acquire allergy to foods that they have previously tolerated.

Following the review, we are considering the future direction of our work and the priority areas for our research over the next five years in order to support our policy needs.

## Chapter 3: Using science and evidence to develop policy

### Policy development

The Agency bases its policy development on the best available science and evidence. This reliance on science is central to our risk analysis, which can be described as an ongoing interaction between risk assessment, risk communication and risk management.

The risk assessment informs the risk management, which is the process of deciding between two or more possible courses of action, taking into account the associated risks, costs and benefits and the uncertainties in the risk assessment. The risk management process has to balance the science and evidence against other factors, such as impact and proportionality and social or political issues. Clear, open communication is an essential component throughout all stages of risk analysis. We aim to ensure effective risk management and communication, but not at the expense of ignoring the science or constraining innovation or consumer choice.

The Agency led a Working Group of the network of Heads of National Food Agencies in Europe which explored how to ensure greater transparency in the use of risk assessment in management decisions that affect food safety, and in particular how to avoid the misuse or misrepresentation of uncertainty to justify decisions that are actually based on other factors. The report on the 'Transparent use of risk assessment in decision making', which was published in 2012, concludes that the basis for policies, and the information and analysis used in policy development, must be clear, rational and justifiable. See the text box on the next page.

BACK TO  
CONTENTS



## In focus

### Transparent use of risk assessment in decision making

The Working Group of the network of Heads of National Food Agencies in Europe concluded that a principal challenge is for risk management to develop and promote transparency and rigour in the decision-making process comparable to that in the risk assessment process.<sup>69</sup>

The Working Group made recommendations for how these objectives can be achieved.

For example:

- Risk managers need to be clearer and more consistent in setting out how the other legitimate factors besides risk assessment (such as economic, social or political considerations) have been taken into account, including the contribution and reasoning behind the consideration of other factors and the supporting evidence and/or expert analysis.
- The Heads of Agencies should maintain awareness of and support efforts to explore the potential for and the development of methods for robust, evidence-based analysis of other factors.
- There needs to be more clarity on the extent to which treaties and legal measures at global, EU and national level allow or limit the use of other factors in decision making.
- Risk managers need to be clearer and more consistent in setting out the basis for applying the precautionary principle and in particular the uncertainties and gaps in evidence, and what would be needed to address these.



There should always be scope to decide policy approaches according to other factors, providing there is no unacceptable negative impact on consumer health. Nevertheless, there should be evidence to support decisions so that the basis of decisions is clear and uncertainties are stated.



### 3.1 The review of the delivery of official controls

The majority of checks and activities needed to monitor and secure business compliance with food law are delivered on our behalf by local authorities and port health authorities, which are known as competent authorities. The Agency's Board agreed the current delivery structure for official controls should be reviewed to ensure we are meeting our responsibilities to protect consumers' interests in relation to food.<sup>70</sup> It was thought there may be some inconsistencies across the current UK official controls delivery model that needed investigation.

Reasons for the review included:

- the effectiveness of the current delivery system had been questioned in a number of reports, including the public inquiry into the September 2005 outbreak of *E. coli* O157 in Wales,<sup>26</sup> and Lord Young's report 'Common Sense Common Safety'<sup>71</sup>
- the European Commission, through its Food and Veterinary Office (FVO), had expressed concern about the complexity of the UK delivery model
- there was a need to understand the impact of budgetary pressures and consider how best to secure efficiency, resilience and sustainability in this public health protection function

The review aimed to evaluate how effective the current delivery model is and consider the scope for making improvements. Evidence was gathered to assess the current system.

In the first stage of the review information was collated to help us:

- identify areas for improvement in the current system
- identify options for change
- allow for an evidence-based assessment of the impact of any proposed changes

This phase was completed during the past year and an overview of the work undertaken is provided in the text box on the next page.

## In focus

### Evidence-gathering for the review of official controls in the UK

The programme of work in the evidence-gathering phase covered the following areas:

#### The UK food industry

Initial work was conducted in-house by Agency analysts to provide an overview of the food industry and food supply chain in the UK. The opportunities, issues and challenges for delivering effective official controls throughout the food chain at a local and national level were investigated. Information from market reports for sectors of the food chain was incorporated.



#### Assessing the role of the Agency as the central competent authority responsible for oversight of local authority delivery of food official controls

Our core role to direct and support the delivery of official controls by local authorities and port health authorities was assessed, to understand the strengths and weaknesses of how we deliver it. The assessment was undertaken by the Agency but an independent expert panel provided direction, challenge and oversight to the work.

The initial phase of this work identified our legal obligations and developed process maps to outline how we deliver these. Emerging themes were used to focus and define evidence gathering activities to allow us to assess the effectiveness and resilience of the delivery of the current system.

Data were gathered from existing evidence from within the Agency, and these were supplemented with additional information gathered from both internal (Agency staff) and external (delivery partners in local authorities) sources through interviews, workshops, focus groups and an online forum.



BACK TO  
CONTENTS



### **Review of international models for feed and food official controls<sup>72</sup>**

This project reviewed the structural arrangements for the delivery of official controls for food in EU member states and in selected other countries. It included the collection of information on delivery mechanisms, and identified the key features of each system. An assessment and critical analysis of the systems in place has allowed good practice and lessons learned to be correlated and compared with the delivery model for official controls currently followed in the UK.

### **Overview of delivery of official controls for food safety<sup>73</sup>**

This project collected information on the current UK delivery model, the resources available, other areas of responsibility for the competent authority, variations in practice, and how the system is adapting to cuts in budget and changes in remit.

Work included:

- mapping the official control structures across local authority and port health authority food teams in the UK
- undertaking an assessment of currently available data sources to determine data gaps that needed to be filled
- carrying out an online survey for local authorities and port health authorities to gather the information required to fill the data gaps

There was a high level of engagement with a 67% response rate to the survey. The survey design has allowed analysis of the data on an individual country basis as well as allowing us to get a UK picture.

Data collected on priorities and decision making suggest that respondents felt that food hygiene and food standards delivery was prioritised and was visible at a political level in the majority of responding local authorities.

The information gathered supplements the information available from the Agency's Local Authority Enforcement Monitoring System (LAEMS).<sup>74</sup>

### **An in-depth study of delivery of official controls in the UK<sup>75</sup>**

A number of case studies with local authorities were undertaken to help us understand in detail how the delivery of official controls is carried out.

Information was collected on:

- what an enforcement officer does, the range of work they deal with and how their time is split between the various tasks



- how official control processes work in practice and the volumes, timings and costs of these
- how food safety interfaces with other areas of the authorities' work, such as advice to consumers, interactions with laboratories, health and safety
- how front-line official controls delivery is supported by other functions in the local authorities and port health authorities (such as human resources, administration) and the costs and benefits of these
- how authorities are responding to changes in funding and ways of working in the face of wider political and economic change

The information has identified examples of best practice, to help improve effectiveness and efficiency. It will help identify risks and areas for improvement and an understanding of the impact of the changes that are happening at the local level.

### Horizon scanning – future scenarios

A horizon scanning and futures project was carried out for the Agency by the Collaborative Centre of Excellence for Natural and Environmental Risks and Futures (CERF) at the Cranfield University.<sup>76</sup> The aim was to develop plausible future scenarios for the UK food and feed delivery system, which will allow testing of the resilience of the current model and potential alternative delivery models. See Chapter 6 for more about the Defra-led partnership at CERF.

The evidence gathered in this first stage of the review suggested that although the current system of official controls remains under pressure, in general the local authorities consider they are able to deliver the service. The emerging findings were considered by the Board at the March 2013 meeting.<sup>77</sup> It was acknowledged that the review of official controls has established an extremely useful and comprehensive evidence base for assessing the Agency's role as the central competent authority and the delivery of food safety official controls by local authorities.

The Board noted the changes in the wider environment, such as the movement of public health functions into local government in England, which means that there may be significant scope for complementary activity at a local level that could enhance public protection in terms of risks attributable to food. In addition the formation of the new Scottish food body<sup>42</sup> and the local government reform plans in Northern Ireland and Wales will have significant impact on us being able to consider structural changes to the current delivery model.

The Board agreed that the review of official controls in the UK should be closed down on the basis of the emerging findings and other developments. It agreed that the Agency should consider how this work should be taken forward with the local authority partners, building on the evidence gathered and the engagement routes established, and this would be discussed by the Board later in 2013.

### 3.2 Update on the modernisation of meat controls

Meat controls aim to ensure consumer protection. The current system is based on a traditional inspection approach developed more than 100 years ago to tackle the public health concerns of that era, such as parasites and defects visible to the naked eye, and it cannot detect microbes. We have undertaken a programme of research and work towards the reform of the current system of official meat controls, to improve public health protection while delivering a more risk-based and proportionate system.

The programme of research, which began in 2009, was set up to review the scientific principles underpinning the current system of official meat controls in slaughterhouses. A multidisciplinary approach was adopted which includes veterinary research, risk assessments, cost-benefit analyses and social science research. The results from the first phase of the programme were formally evaluated by external experts,<sup>78</sup> and it was recommended that trial projects should be carried out to test the outcomes of these qualitative risk assessments. Four of the five projects in the second phase of research have been completed and the reports were published in 2013. See the text box below.

#### In focus

### Future Meat Controls Research Programme: second phase results

#### Review of Food Chain Information (FCI) and Collection and Communication of Inspection Results (CCIR) for all species<sup>79</sup>

The results suggest that the FCI reporting system should be maintained. Most large scale pig and poultry producers and processors reported using it effectively, and they consider it provides essential information to produce quality products. Conversely, small scale producers and the Food Business Operators (FBOs) they supply did not always share this view.



Many cattle and sheep producers and FBOs felt it is a burden to compile the FCI and suggested it was not particularly useful. Some FBOs and Official Veterinarians (OVs) questioned the accuracy of some of the reporting elements, and this, together with inspection results, made them believe it is unhelpful for targeting inspection tasks, which might improve food safety and animal health and welfare.

However, cattle and sheep producers felt that it would be advantageous if FCI is comprehensively applied. All sectors stated that FCI should be linked with farm assurance schemes, in order to gain more information about individual animals or the conditions of herds and flocks on farm. Producers could forward this information to OVs and FBOs in the plants before animals are sent to the slaughterhouse.

The CCIR requirement is seen as a successful tool for the larger poultry and pig producers and processors, who obtain information through the inspection recording database. However, most of the cattle and sheep producers stated that they did not regularly request inspection results.

The main recommendations were to:

- carry out a risk analysis for each species to account for differing production and marketing systems, to highlight key information for recording rather than minimum elements
- improve knowledge of the FCI role, by developing a communications programme, to be targeted at cattle, sheep and pig producers outside the larger integrated chains
- help FBOs recognise the value of FCI information and how this could be used to improve the safety of their products

### **Qualitative risk assessment of visual inspection of cattle, sheep, goats and wild/farmed deer<sup>80</sup>**

This research focused on a risk and benefit assessment for changing from the traditional post-mortem inspection system (visual inspection, incision and palpation), to visual-only procedures for cattle, sheep, goats and farmed/wild deer. Hazards were selected and matched with appropriate species and were shortlisted where they were considered vulnerable to a change in risk.

In this study, all production systems that met the criteria as laid down by Regulation (EC) 1244/2007 for visual-only post mortem meat inspection, were defined as 'conforming' systems and those that did not as 'non-conforming' systems.



The findings included:

- public health risk assessment indicated that all hazards paired with species were of negligible or low risk, except *Cysticercus bovis* in cattle, which was judged to be low to medium, with an increased risk for systems which were 'non-conforming' compared to 'conforming' systems, as defined in the regulation
- most hazard/species pairings suggested a potential increased risk to animal health/welfare
- bovine tuberculosis (TB) was the only confirmed non-negligible risk for animal health and welfare, but this was judged as low risk
- more research is needed to measure to what extent contamination would be reduced following exclusion of certain palpation and incision procedures, and whether this would have a reciprocal reduction in public health risk

### Trial of visual inspection of fattening pigs from non-controlled housing conditions<sup>81</sup>

More than 11,000 carcasses of fattening pigs from non-controlled housing conditions were inspected using both post mortem inspection methods (traditional and visual-only inspection).

Statistically significant differences in the frequencies of some conditions were found by the two inspection methods. For example, the frequencies were higher with the traditional method of inspection for renal pathology and pluck (heart, respiratory system and liver) pathology.

Five possible public health hazards were selected for further investigation, and the results indicated:

- the risk associated with endocarditis changed from negligible to very low after visual-only inspection, while the risk of microbial cross-infection might be reduced
- *Salmonella* spp. was not isolated from any of the samples
- no statistical difference was found in the proportion of carcasses contaminated with *Yersinia* spp. after the two inspection methods
- when carcasses were examined where *Enterobacteriaceae* were present, there was some evidence that the level of carcass contamination was lower after visual-only compared with traditional inspection

Overall there was some evidence for a possible reduction in the cross contamination of carcasses by changing to a visual-only system where handling of carcasses was minimised.

It was concluded that the same major issues would be expected with the introduction of a visual-only inspection system for pigs from non-controlled housing conditions ('outdoor' pigs) in the UK, compared with the introduction of visual-only inspection for fattening pigs from controlled housing conditions ('indoor' pigs).

### Slaughterhouse social science project<sup>82</sup>

Information was gathered on the social processes in place within slaughterhouses to gain insight into the potential impact of regulatory reform. The objectives of the research were to:

- understand the current behavioural and social influences in slaughterhouses and their impact on processes and structures
- explore in detail what encourages or discourages duty holders and employees to take ownership of food safety
- understand how Official Veterinarians (OVs) and Meat Hygiene Inspectors approach enforcement

The main findings:

**Roles:** Officials were concerned with protecting consumers. OVs saw their roles as safeguarding public, animal health and welfare by ensuring compliance with slaughterhouse regulations, while the Official Auxiliary's role was to ensure that meat was fit for human consumption. Food Business Operators (FBO) felt that providing quality meat to retailers was their primary role, while slaughterhouse staff remained focused on carrying out their allotted tasks.

**Food safety:** FBOs held different interpretations of their food safety obligations and often their understanding differed from that of the Agency. For many FBOs, providing quality meat by ensuring carcasses passed post-mortem inspection was more important than overall food safety management of the plant.

**Ownership of food safety:** If FBOs had a better understanding of food safety risks, it could help drive ownership of food safety. In addition, if the reasoning behind regulations and officials' requests was clearly understood, they would be able to communicate food safety messages more effectively to their staff.

**Mindsets:** Few FBOs had a comprehensive view of food safety, and because officials were always present in all slaughterhouses, food safety outcomes were dependent on the relationships between officials, FBOs and staff.





**Regulation:** It was generally believed that the current regulatory regime was effective in ensuring that meat was fit for human consumption. However, many FBOs and a few officials criticised the current regime, in particular costs and a lack of consistency regarding interpretation of regulations.

Participants recommended:

- audits should be carried out by independent inspectors
- the introduction of an 'earned recognition' system
- farmers should take more responsibility for livestock hygiene
- there should be better education for consumers regarding meat handling and storage after purchase

#### **Feasibility study of a Plant Inspection Assistant inspection model in approved game handling establishments**

Work is underway to assess whether the use of Plant Inspection Assistants in approved game handling could represent a risk to public health, animal health and welfare and whether this is a feasible model of inspection. The report is expected to be published in autumn 2013.

Official controls on meat are prescribed by European legislation. Any changes to the controls have to be negotiated with other EU member states and the European Parliament. We are actively involved in discussions with the European Commission and other member states, as well as engaging with countries outside the EU, industry and consumer groups.

The European Food Safety Authority (EFSA) is carrying out risk assessments on current meat controls. EFSA's mandate is to identify and rank public health hazards in meat, and it may recommend possible improvements or alternative methods for inspection of meat. This may include revising current methods that may not be adequate in detecting risks or which are disproportionate to the risk involved. EFSA's recommendations must take account of the impact of proposed changes in meat inspection on animal health and welfare monitoring, and propose possible remedies if required.

EFSA's ranking will cover a wide range of hazards that are targeted by existing inspections such as the causative agents of cysticercosis, trichinellosis, glanders in solipeds (single-hoofed mammals, e.g. horses), tuberculosis and brucellosis, but it may be broadened to other hazards. The opinion is likely to include chemical hazards and medicine residues. Transmissible spongiform encephalopathies (TSEs) are not within the scope of this mandate.



The EFSA opinion on pig inspection was published in October 2011<sup>83</sup> and the opinion on poultry meat inspection in June 2012.<sup>84</sup> The latter highlights the concern that traditional poultry meat inspection does not enable the detection of the most important meat borne hazards to public health (campylobacter, salmonella and ESBL/AmpC gene-carrying bacteria), and it recommends improvements to the current system.

European Commission negotiations on the draft proposals to amend pig meat inspection have started. The proposals take into account the findings of the Agency-funded research and EFSA's scientific opinion on pig meat inspection,<sup>85</sup> and they represent a move towards more risk-based controls. A task group composed of industry technical experts and government policy makers will scrutinise the proposed changes to provide rapid advice as the negotiations progress.

The plans for the third phase of the Agency's research work will be reviewed when the EFSA opinion on red meat species is published. The opinion is expected by summer 2013.

## Monitoring

To ensure consumer protection and food safety, monitoring is carried out at every stage of the food chain. The Agency has staff working to check hygiene in certain premises (meat inspection duties in fresh meat premises in England, Scotland and Wales), and we also provide advice, practical support materials and funding for local authorities to help them carry out inspections and sampling programmes at a national and local level.

### 3.3 Monitoring food safety during the 2012 Olympics and Paralympics

Food safety is an essential component in the planning for any major sporting event. The Agency's preparation for the London Olympic and Paralympic Games included work to identify the risks associated with the food supply and food service. Together with the London Organising Committee of the Olympic Games (LOCOG), enforcement officers, food industry representatives and other partner organisations, we developed a programme of work to provide food safety assurances both ahead of and during the Games.

We co-ordinated a large programme of food-safety related interventions. This included provision of funding for additional local authority surveillance and inspection work. The risk-based sampling programme was based on evidence collected from across government and international agencies, from emerging risk programmes, from previous food safety incidents and the Rapid Alert System for Food and Feed (RASFF).<sup>86</sup> Our sampling programmes incorporate specific requirements contained in legislation, which places direct controls on imported food and feed. The UK Food Surveillance System (UKFSS), which allows local authorities to upload all their sampling information and results into a single database, was used to analyse data to highlight emerging trends and any non-compliances.<sup>87</sup>



We provided ATP (adenosine-triphosphate) hygiene monitoring systems to local authority environmental health officers (EHOs), to enable the rapid monitoring of the hygiene of food contact surfaces. EHOs were able to conduct interventions, particularly with the high risk food business operators targeted during the run up to the Games.

ATP units provide an indication of effectiveness of cleaning and bacterial contamination, and results from the tests are available within 15 seconds, which is much quicker than standard swabbing techniques, where laboratory analysis is required. The lightweight handheld devices measure ATP, a molecule found in all animal, plant, bacteria, yeast and mould cells. When ATP is brought into contact with liquid-stable luciferase/luciferin reagent in the testing device, light is emitted in direct proportion to the amount of ATP present and this provides information on the level of contamination. The amount of ATP present in microbial contamination is smaller than the amount in residues of food or organic residue.

As a result of the planning, preparation and partnership work, there were no major food-related incidents during the 2012 Olympic and Paralympic Games. A huge volume of food was served during the Games, and the event was a big success in terms of food-safety.

### 3.4 Horse meat in beef products

In January 2013, the Food Safety Authority of Ireland (FSAI) published the results of a survey of beef products purchased from Irish retailers in November 2012. Of 27 beefburger products analysed, 10 (37%) tested positive for horse DNA and 23 (85%) tested positive for pig DNA. In nine of the 10 beefburger samples, horse DNA was found at very low levels, but in one sample the level of horse DNA indicated that horse meat accounted for approximately 29% of the total meat content of the burger.<sup>88</sup> Subsequently several further cases of horsemeat contamination were found in the UK and in other European countries.<sup>89</sup>

The Agency was asked to launch an urgent investigation in response to the findings. We worked in conjunction with other government departments, local authorities and the food industry to identify the source of the contamination and the distribution of implicated products.

In February 2013, we involved the police both here and in Europe, after evidence from two cases of a significant amount of horse meat in burgers and lasagnes suggested either gross negligence or deliberate contamination of the food chain. See the text box on the next page.

## In focus

### Horse meat investigation

The Agency has been involved in a range of activities in the investigation of contamination of beef with horsemeat. Throughout the investigation we issued consumer advice on our website.



#### Testing and surveillance

The aim of this work is to establish the extent of any contamination and its causes.

#### Industry tests

Food companies are legally responsible for the safety of the food they sell and the accuracy of its labelling. We instructed food businesses to conduct authenticity tests on all beef products, such as beef burgers, meatballs and lasagne, and worked with trade bodies in the food industry to collate these results as quickly as possible, to get an accurate picture of the testing being carried out across the UK food chain.

Where products were found to contain horse DNA, they were also tested for the presence of the veterinary drug phenylbutazone, also known as bute. Low levels of bute had previously been identified in horse meat in Agency-funded testing in 2012. Bute can cause rare cases of a serious blood disorder, aplastic anaemia. Although the levels of bute found were not considered to be a risk to human health, we began a system of positive release for horses slaughtered in the UK at the end of January 2013. Horses intended for human consumption are now tested for bute at slaughter, and meat is not allowed to enter the food chain unless it tests negative for bute.

The results of the food industry testing phase have been published on our website.<sup>90</sup> By the 1st March 2013 the Agency had received 5,430 industry test results, and the main findings were:

- the vast majority (over 99%) of tests showed no horse DNA at or above the level of 1%



BACK TO  
CONTENTS



- there were 17 products confirmed as containing over 1% of horse DNA
- a further two products containing over 1% of horse DNA were identified through separate tests
- the veterinary medicine bute was not found in tests of the products containing horse DNA

A level of 1% (DNA or meat) has been used as a pragmatic level to distinguish between gross contamination or adulteration, and 'trace' levels of carry-over from one species or product to another.

Industry has continued to test for the presence of horse DNA in its beef products, and report to the Agency. Further results will be published on our website at quarterly intervals. However, businesses are required to notify us immediately of any confirmed cases of gross contamination, that is, above 1% horse DNA.

### Local authority tests

We also undertook our own independent surveillance programme to assess the scale of the contamination problem. In February 2013, we published a protocol for a large scale survey to be carried out through local authorities, to provide information about the possible presence of horse or pig DNA in a range of beef products available in the UK. The protocol was drawn up in collaboration with Defra, the devolved rural affairs departments and local authorities.

The European Commission also asked all member states to put official control plans in place, that allow sampling and testing for the presence of horse DNA in foods marketed or labelled as containing beef.

In the UK, local authorities collected and tested 150 samples of beef products, and the results of the analyses will be reported to the EU along with details of any follow-up action taken. The sampling and testing for this EU programme is the third phase of the Agency's UK-wide survey of food authenticity in meat products.

We published the results of the first two phases of the survey\* at the end of March 2013.<sup>91</sup>

- 352 out of 362 samples were negative for the presence of both horse and pig DNA
- two of the original 364 samples failed to meet the criteria outlined in the sampling protocol and have therefore been discounted

\*A full report of the incident covering all three phases can be found on the Agency's website.<sup>92</sup>



- one product, labelled as halal, was found to have trace levels of pig DNA
- of the remaining 10 samples, three were confirmed as containing pig DNA at or above the 1% threshold
- a further two have been confirmed as containing horse DNA at or above the 1% threshold (both of these products were previously reported by the food industry's own results)
- the results of the last five samples were challenged and further independent tests were carried out to check if the products were found to be positive for contamination above the 1% threshold

### Research

Further research is required to explore how to distinguish between gross contamination or adulteration and 'trace' levels of undeclared species, which could still be present unavoidably even where food businesses follow good practice in hygiene and process control. We are funding work to provide a more robust evidence base for discussions, and we are working closely with Defra and industry representatives.

The research is based on three strands:

- what levels of 'carry over' are **achievable** when following good practice at different stages of meat processing
- work to develop and validate analytical methods to understand what levels of meat contamination are reliably **detectable** and quantifiable
- research with consumers on their views and concerns on what is **acceptable** with regard to levels of 'trace' carry over and how it is managed or controlled

Where the level of horse or pig DNA detected exceeded 1%, and for the product labelled as halal, we required businesses to take appropriate action, including withdrawing the relevant products from sale and instituting a product recall. Information from the company and traceability records were used to identify the supply chain for the product. We continue to work with others, including local authorities and the police, to take robust enforcement action where appropriate.

The level of 1% DNA or meat, the pragmatic level used to distinguish between gross contamination or adulteration, and 'trace' levels of carry-over from one species or product to another, will be reviewed once the results of the research mentioned in the text box above are available.

It is unacceptable for meat products to contain undeclared species of animals and for consumers to be misled. An independent review of the Agency's response to the horse meat incident was announced at the April 2013 Board meeting.<sup>93</sup> This will be wide ranging, to restore and maintain consumer confidence in the food chain and consider the responsibilities of food businesses, and practice throughout the wider food chain.

## Chapter 4: Research highlights and expenditure

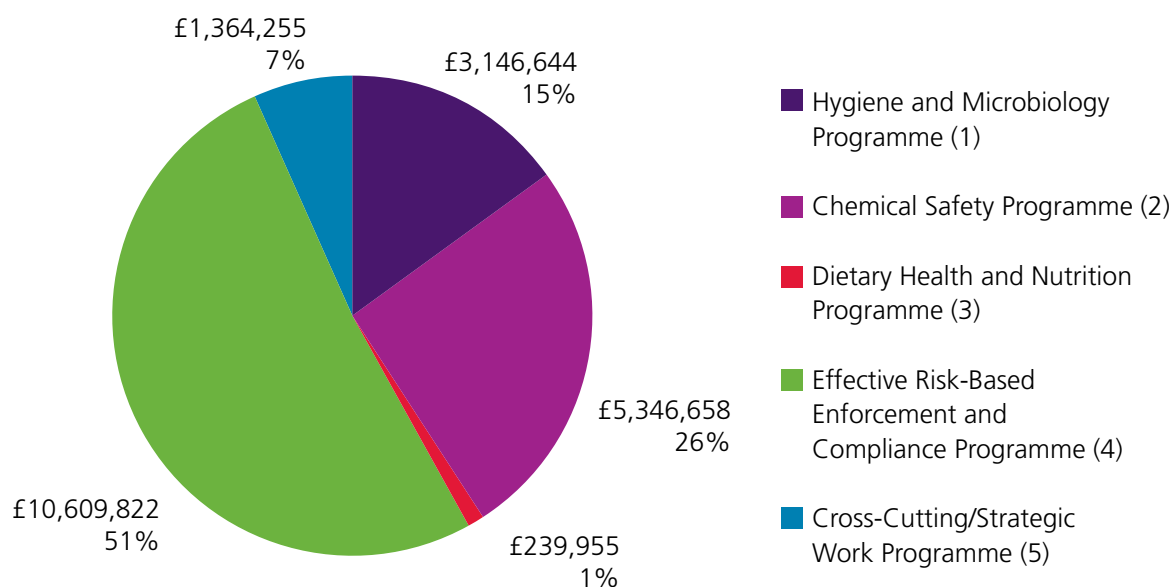
### Science and evidence

The Agency is an evidence-based organisation and we are committed to an open, science and evidence-based approach and to independent scientific advice, to help us make real progress in achieving our goal of safer food for the nation.

#### 4.1 Analysis of our science and evidence expenditure

In 2012/13 we spent £21 million on commissioned science and evidence-gathering work. Figure 14 shows how this was divided between the five strategic themes.

**Figure 14** Science and evidence-gathering portfolio spend 2012/13<sup>i</sup>



<sup>i</sup> In October 2010, the responsibility for nutrition transferred from the Agency in England and Wales. The 2% expenditure for dietary health and nutrition only covers nutrition work funded by the Agency in Scotland and Northern Ireland.



The work includes investigative or hypothesis driven research, social science research, food surveys, statutory monitoring (meat, dairy, shellfish and radiological), statutory support to UK National Reference Laboratories, and programme support (sample collection and storage, workshops, scientific advisory committees, expert advice, peer review and knowledge transfer).

Summary tables for the five programmes, with information about all the science and evidence-gathering work funded by us in the past year, including financial information, can be found in Annexe A.

The statutory work falls principally in programmes 1, 2 and 4. In the past year we spent £2.6 million on radiological monitoring and surveillance, of which around three quarters was subject to recovery from industry. We also spent £3.8 million on shellfish and marine biotoxin monitoring and surveillance.

In the past year we spent £1.2 million on social science research, which falls across all five programmes.

The Cross-Cutting/Strategic Work Programme consists of underpinning work, such as the Agency's contribution to the National Diet and Nutrition Survey, as well as longer-term work, including horizon-scanning and the strategic challenge. In 2012/13 we spent £0.5 million on dietary surveys, which are used to inform chemical exposure assessments, support risk assessment across the Agency and support the Agency's continuing responsibility for nutrition in Scotland and Northern Ireland (see Chapter 2). The strategic challenge is an open call that seeks to elicit a wide range of innovative proposals focused on meeting the Agency's strategic objective to improve food safety.<sup>94</sup>

We continue to collaborate with other funders and to benefit from the wider base of evidence and expertise, in the UK and internationally. We provided £2.3 million to co-fund 26 projects in 2012/13. Further details of co-funded projects can be found at Annexe B.

The Agency provided £112,000 during the past year to EU projects with strong links to Agency needs.

## Science and evidence highlights

### 4.2 Hygiene and microbiology

#### Norovirus research

There are significant gaps in our knowledge with regard to the proportion of UK-acquired norovirus infections related to the consumption of food. In July 2012, we published the results of an Agency-funded critical review which aimed to address some of these gaps.<sup>19</sup> See the text box on the next page.



## In focus

### A critical review of methods for distinguishing infectious and non-infectious norovirus

The review identified methods used to detect norovirus in food, the environment, and in clinical samples, and to assess the potential of these methods to distinguish infectious and non-infectious norovirus.

The review focused particularly on approaches capable of assessing whether the condition of the norovirus capsid or ribonucleic acid (RNA) can be used as a guide to the likelihood of the virus infecting people.

The Reverse Transcription Quantitative Polymerase Chain Reaction (RT-qPCR) assay is the most widely used method to detect human noroviruses.

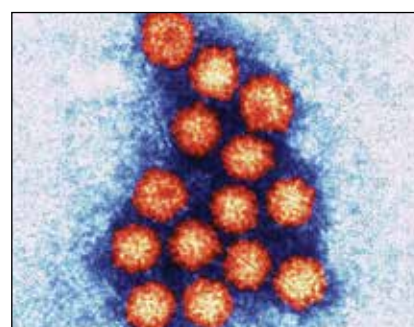
However, it is unable to discriminate between infectious and non-infectious virus particles, which results in a dilemma in assessing the risk to human health from samples detected as positive in RT-qPCR assays.

This short critical literature review considered all detection and quantification methods, including molecular techniques. Each method was critically assessed for:

- their respective strengths
- weaknesses
- their capacity to distinguish between infectious and non-infectious norovirus particles

The levels of norovirus detected in food by RT-PCR are lower than those in clinical samples and this was taken into account in assessing the different approaches and options. Each approach identified was assessed for the feasibility of their use in routine laboratories and applicability to testing in real food systems.

Comparison of data in this review was complicated by the wide range of different viruses and experimental conditions used in different studies.



#### Main findings:

- Defining an infectious virus is complicated and there is no standard as to what constitutes infectious human norovirus. However, it is clear that RT-qPCR methods alone cannot currently distinguish infective and non-infective virus.
- Current RT-qPCR methods used to detect infectious human norovirus rely on the generation and detection of a fluorescent signal without secondary confirmation of product identity. Improved characterisation of RT-qPCR products by direct sequencing or electrophoresis would increase confidence in the validity of current test results.
- It is known that infectious human norovirus are resilient and can persist and retain infectivity in the environment. It is also possible that the products of degraded virus particles, viral RNA and ribonucleoprotein complexes (RNPs), could persist in the environment leading to false positive identification of infectious human norovirus. However, the occurrence of RNPs in the environment has not been investigated.
- RT-qPCR signals may be obtained from the products of degraded virus particles, i.e. RNA and RNPs, as well as from intact particles. Sample pre-treatment can allow differentiation of these RT-qPCR signals. Further research is required to differentiate these signals reliably in relation to infectious particles and whether these signals could be applied to the draft method of the European Standardisation Organisation CEN, used to detect human norovirus in foods and the environment.

We are exploring the possibility of funding further research in this area.

### Reducing *E. coli* O157 shedding in cattle

Verotoxigenic *E. coli* (VTEC), including *E. coli* O157, are important human pathogens and a high priority for Agency action. The public inquiry into the 2005 outbreak of *E. coli* O157 in South Wales recommended that the feasibility of identifying 'supershedder' cattle on farms should be explored as a potential means of reducing the likelihood of spreading *E. coli* O157 to other cattle.<sup>26</sup> However, the routine testing of livestock may not be a cost-effective or practicable means of preventing 'supershedders' entering the slaughterhouse.

In February 2013, we published the results of a study to evaluate the feasibility of introducing currently available methods to reduce *E. coli* O157 shedding in cattle on UK farms.<sup>30</sup> See the text box on the next page.



## In focus

### Feasibility of introducing methods in the UK for reducing shedding of *E. coli* O157 in cattle

A literature review on the efficacy of control measures for reducing *E. coli* O157 shedding in livestock identified 221 relevant scientific publications dating from 1990 to 2011. From these, only three control strategies were identified which had sufficient quantitative data on their ability to reduce shedding levels and/or the prevalence of infected cattle. This allowed models to be developed to undertake cost-benefit analyses. These were:

- the use of probiotics in feed
- the vaccination of animals
- a combined package of eight biosecurity measures



Both vaccines and probiotics have shown promise in North American studies. Mathematical models were used to predict the reduction in human infections that may be expected following the application of each of these control options. The financial benefit that may be gained through prevention of human illness was also calculated. The results suggest that using vaccines or probiotics to control *E. coli* O157 could, in some circumstances, payback the costs. However, this outcome is heavily dependent on the preventable human losses, especially the severity of human illnesses and not just the number of cases prevented.

The views of UK farmers on adopting measures for controlling *E. coli* O157 in cattle were also examined. A telephone survey of 405 cattle farmers, and an online survey of 91 farmers that deliberately open their farms to the public, was carried out. The findings from this survey of farmers suggest:

- there is an awareness of *E. coli* O157, and the threat that it poses to public health, but there is a reluctance to adopt any control measures that they do not know to be efficacious and safe
- the benefit of implementing on-farm controls for *E. coli* O157 is not obvious to farmers



The findings suggest that increasing all farmers' access to information, and specifically targeting: dairy farmers; those who open their farms to the public; and those affected by past outbreaks; would help to improve levels of awareness and change attitudes with regard to the adoption of on-farm controls for *E. coli* O157.

Further engagement with relevant groups indicated that the open-farm sector was interested in exploring the use of vaccines.

Demand for the application of on-farm controls for *E. coli* O157 by beef and dairy farmers in the UK is likely to be limited, until there is further evidence to demonstrate efficacy in farming systems, and more obvious drivers for the implementation of such measures are identified. A number of recommendations for future work were made in the report, which we aim to take forward later in the coming year.

### 4.3 Chemical safety

#### Metal uptake in fruit and vegetables

During growth, fruit and vegetables take up metal contaminants, such as arsenic, cadmium, lead, copper and zinc from the surrounding soil area. Arsenic, cadmium and lead have no known beneficial health effects, while copper and zinc can act as nutrients and are essential for health. However, each of these metals may be harmful if excessive amounts are consumed.

We have investigated the levels of metal contaminants in fruit and vegetables. The report of this research was published in June 2012. See the text box below.<sup>95</sup>

#### In focus

#### Arsenic speciation in fruit and vegetables grown in the UK

The European Food Safety Authority (EFSA) has concluded that dietary exposure to arsenic, cadmium and lead should be reduced. Additionally, the Joint Food and Agriculture Organization and the World Health Organization Expert Committee on Food Additives (JECFA) agree that it is not possible to set a tolerable lead intake and therefore minimisation of exposure to lead from all sources



is desirable. We consider that exposure to arsenic, cadmium and lead should be reduced to as low as reasonably practicable.

Basket products from local farm shops, greengrocers, pick-your-own farms, supermarkets and farmers markets, and samples of field produce and associated soil samples were collected and analysed to determine the levels of arsenic, cadmium, lead, copper and zinc.

Samples from two geologically stable arsenic enriched regions in South West England were collected and analysed from late autumn 2010 through to late summer 2011, to ensure that seasonality of crop production and climate were taken into account. Fruits and vegetables that are normally washed and peeled in the home were sampled to enable a comparison of the levels of arsenic, cadmium, lead, copper and zinc in unpeeled and peeled produce.

Basket produce from a region in North East Scotland known to contain comparatively low levels of arsenic in the soil, were analysed for total arsenic, cadmium, lead, copper, and zinc for reference purposes.

All produce and soil analyses were carried out using inductively coupled plasma mass spectrometry (ICP-MS).

Main findings:

- the concentration of total arsenic in most of the produce categories from the market basket survey was low in the south west, and even lower in the north east surveys
- the highest total arsenic and cadmium levels were present in kale, chard, lettuce, greens, and spinach – possibly due to soil contamination on the leaves
- the aluminium concentration of the open leaf structure produce was determined and a significant positive correlation was observed between aluminium and total arsenic concentrations, indicating that the elevated total arsenic concentration may be due to soil contamination
- there were significant correlations between the total arsenic concentration in produce and the arsenic concentration in soil for the field survey potatoes (unpeeled and peeled), root vegetables (unpeeled), cabbages, and cauliflower and broccoli (including Romanesque) grouped together
- for peeled root vegetables, open leaf structure produce (kale, chard, lettuce, greens, and spinach) and soft fruits, there were no significant correlations between produce total arsenic concentration and soil arsenic concentration



- for 'below ground produce' such as potatoes, the levels of soil arsenic may be a determining factor in the levels of arsenic found in the produce, whereas for produce grown above the ground this may not always be the case
- on average 98.5% of the total arsenic from basket and field produce collected in South West England was present in the inorganic form
- the levels of total arsenic, cadmium, lead, copper and zinc in baked potatoes sampled from South West England were found to be higher in the potato skin than in the flesh
- the level of total arsenic in potato skin was on average 75 times greater than that found in potato flesh

Laser ablation (LA) ICP-MS was used to establish the gradation or distribution of arsenic, cadmium and lead from the 'skin to core' in peelable produce. The results indicate that the total arsenic level found in the skin of beetroot and potatoes was consistently elevated, typically within 2mm from the surface, but there was no indication of arsenic elevation in the skin of carrots, apples, and parsnips.

The results do not raise concern about risk to human health from these metal residues. Our advice to consumers on how to wash and peel fruits and vegetables remain unchanged. We are currently carrying out further investigations into the level and distribution of these and other metals in UK grown fruits, vegetables and cereals. The results of this further research are expected to be published in 2014.

### Threshold allergenic doses

At present there are no internationally agreed limits for the unintentional presence of allergens in pre-packed food. The use of precautionary allergen labelling such as 'may contain x' is used by manufacturers to communicate the risk to the consumer where allergens may be present following cross contact. However, due to the lack of agreed action levels, the use of precautionary allergen labelling has become widespread. This has resulted in restricted food choices for the allergic consumer, and this often leads to them taking unnecessary risks by eating food which may not be safe for them, to ensure they achieve a healthy balanced diet. The widespread use of precautionary allergen labelling has resulted in consumer mistrust and a devaluation of this type of warning. To address this issue, we are funding a programme of work which focuses on facilitating the development of allergen management threshold levels (the highest level of an allergen that does not cause a reaction in the food allergic population). See Chapter 2 for more information about our Food Allergy and Intolerance Research Programme.

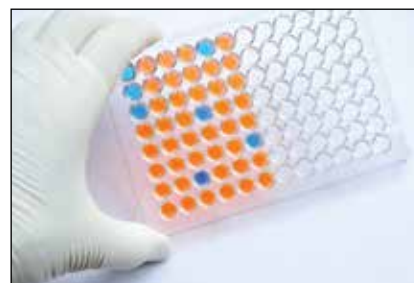


We have funded work to obtain accurate data on threshold doses for allergenic foods and to establish whether available methods of analysis can accurately detect and quantify allergens in foods at or around these thresholds.<sup>96</sup> See the text box below.

## In focus

### Management of food allergens: from threshold doses to analysis in foods

This project developed a customised database to bring together and analyse clinical food challenge data from the European Union EuroPrevall\* project and to generate dose response curves and establish eliciting dose values for seven foods (cows' milk, hen's egg, hazelnut, peanut, celeriac, shrimp and fish).



The project also ascertained whether a food challenge material could be utilised as a quality control material for food allergen analysis. Using a multi-laboratory ring trial approach, a range of commercial allergen detection kits were used to recover and measure the presence of egg and milk protein from a chocolate dessert matrix used as a clinically validated challenge material.

The development of a food relevant quality control material will enable the development of relevant standards for use in the validation and assessment of the performance and proficiency of allergen detection methods.

The results from this project demonstrated that the minimum eliciting doses (with objective symptoms) vary between the seven foods investigated. Cows' milk and egg were found to have the lowest eliciting dose of the seven foods. In contrast the level of shrimp required to elicit objective symptoms was much higher.

\* The Agency was a co-funder in the large scale EuroPrevall project, which was funded under the European Union's sixth Framework (FP6) Programme, with the overall aim of improving the quality of life of those with food allergy.





A symptom severity scoring tool was also developed during the project. This visualisation tool allowed representation of symptoms as they developed across the course of a challenge. This provided an objective way to weight symptoms which allowed severity of reactions to be included in the dose distributions models developed. The tool demonstrated that objective symptoms appeared later on during food challenges, i.e. when an individual had been challenged to an increased level of the allergen. Interestingly it was found that certain foods, such as celeriac powder (also known as celery spice) seemed to elicit a more severe profile of symptoms, compared to the other allergenic plant foods (such as hazelnut and peanut). The tool also looked at symptoms of oral allergy syndrome (an allergic reaction limited to the lips, mouth and throat) and showed that it was a poor predictor of the severity of symptoms observed later on in the food challenge.

The results from the multi-laboratory ring trial demonstrated that none of the analytical test kits had the dynamic range to directly quantify either cows' milk or egg protein at all the levels of inclusion. Overall, the egg kits were shown to be the least variable, whilst the cows' milk kits (which largely targeted whey protein and  $\beta$ -lactoglobulin analytes) were shown to be the most variable.

In general, these ring trial data and the eliciting dose values suggest that current methodologies can determine the presence, but in general not quantify accurately, the levels of allergens in foods. In addition, it was found that the level of milk required to elicit a reaction in infants was extremely low and analytical test kits are unable to detect the level of milk protein likely to cause a reaction. Management strategies will need to be developed to manage this risk in this paediatric population. In addition to this, more data may be required to assess the extent to which threshold doses for these allergens change with age.

The ultimate aim of this programme of work is to derive internationally agreed evidence based reference values for the 14 food allergens to help inform decisions on when precautionary labelling is required. We aim to address the significant gaps that exist through our active collaboration with national and international stakeholders, the funding of joint expert workshops and our research. The eventual development of allergen management threshold levels will allow the food allergic consumer to make safe and informed decisions about the food that they eat. It will also allow the food industry to provide a more consistent approach to the application of precautionary labelling and for regulatory bodies to have more of a consistent basis for monitoring and enforcement.

## 4.4 Dietary health and nutrition

### Diet among children in Scotland

A survey was commissioned to monitor children's diets against the Scottish dietary goals.<sup>97</sup> The survey also explored influences on children's food purchasing behaviours around the school day. This study follows a previous Agency-funded study (2006)<sup>55</sup> to monitor progress towards the Scottish Dietary Target for sugar intake in children. See the text box below.

#### In focus

### Survey of diet among children in Scotland

The diet of a sample of children aged 3 to 16 years living in Scotland was assessed by a food frequency questionnaire. A total of 1,674 questionnaires were analysed and interviews, including measurements of height, weight and waist circumference (a new measurement for this survey), were conducted with 1,906 respondents.



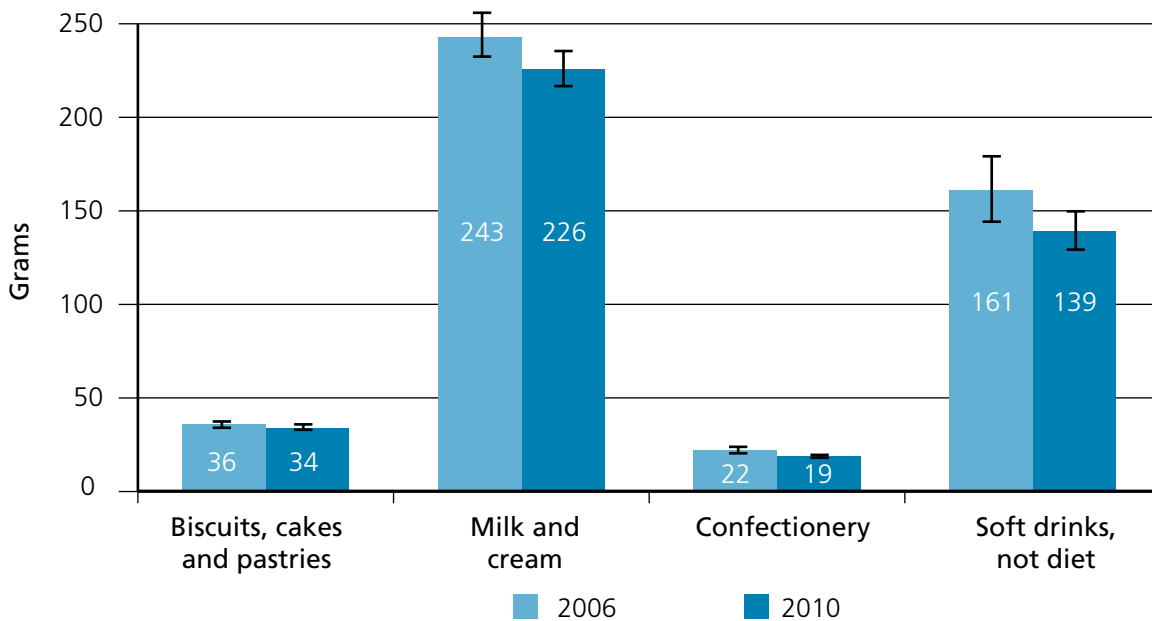
Main findings:

- dietary intakes of non-milk extrinsic sugars (NMES) have decreased to 15.6% compared with 17.4% in 2006, but they are still higher than the Scottish dietary goal of less than 11% of food energy
- non-diet soft drinks, confectionary, biscuits, cakes and pastries, yoghurt and fromage frais and fruit juice are the major contributors to NMES intake
- children living in more deprived areas had higher intakes of NMES
- dietary intakes of total fat were below the Scottish dietary goal
- mean saturated fat intakes were 13.2% of food energy, which is above the recommended level of 11% in all age and sex groups
- milk, cream, biscuits, cakes and pastries were the main contributors to saturated fat intake
- the levels of fat and saturated fat were similar to those found in the 2006 survey
- there was no difference in fat or saturated fat intakes by socio-economic status



The food groups contributing to at least 10% of total intake of NMES or saturated fat were compared between 2006 and 2010. Figure 15 shows that although overall intakes of these food groups decreased between the surveys, the amount was relatively small for biscuits, cakes and pastries and confectionery.

**Figure 15** Mean (95% confidence interval) daily intake of food groups that contributed  $\geq 10\%$  to the intake of NMES or saturated fatty acids in consumers\* in 2006 and 2010



\* Children who consume foods in these groups at least once a month

29% of children were classed as overweight or obese, which is similar to levels reported in the 2010 Scottish Health Survey. The prevalence of overweight and obesity increased with deprivation, from 25% in the least deprived to 38% in the most deprived.

The proportion of children meeting recommended physical activity levels decreased with age. The mean time spent in front of a screen increased with level of deprivation, although the proportion of children meeting the physical activity recommendations was similar across all socio-economic groups.

The food purchasing module indicated that children from secondary school were more likely to report buying food or drinks on the way to or from school. 63% of all secondary school children bought food or drinks outside of school at lunchtime. Children from deprived areas were more likely to report making food or drink purchases. The most common food items purchased by children were confectionery, sugar-sweetened drinks, crisps and water.



This study indicates the intake of NMES and saturated fats in children living in Scotland are still higher than recommended levels. The Scottish Government 'Obesity route map' action plan<sup>98</sup> recommends one way to overcome the over consumption of food high in NMES and saturated fatty acids is to have a better understanding of food purchasing during the school day 'beyond the school gate'. The Agency in Scotland is commissioning a new project that will assist the development of Scottish public health policy regarding the retail food and drink landscape within the vicinity of schools or 'beyond the school gate'. The project aims to provide detailed information on the types of purchases made by school pupils and the drivers for purchasing in relation to deprivation. The results should provide examples of best practice and the types of marketing/promotion or outlets that should potentially be restricted within the immediate proximity to secondary schools.

#### 4.5 Effective risk-based enforcement and compliance

##### Evaluation of cross-contamination guidance

We fund work to evaluate our activities, both in terms of assessing impact and in gathering process feedback to assist continuous improvement.

The results of an evaluation of the Agency's cross contamination guidance were published in November 2012.<sup>29</sup> The evaluation sought to identify awareness of the guidance and feedback from both businesses and enforcement officers. See the text box on the next page. Guidance was developed for industry and enforcement officers following the serious outbreaks of *E. coli* O157 reported in Scotland during 1996 and Wales during 2005. These outbreaks were attributed to cross-contamination arising from poorly managed food handling practices in the commercial setting.<sup>99</sup> Guidance was produced in several different formats: a detailed guidance document; a Q&A document; a DVD for butchers; and a factsheet. Training was also provided for local authorities' enforcement officers. Guidance implementation is ongoing, with a rolling programme of inspection visits underway.

## In focus

### Evaluating Agency guidance on cross contamination

The evaluation of the guidance included:

- a scoping stage to help inform a quantitative survey
- a quantitative survey of both food business operators and local authorities to gain a better understanding of how the guidance has been received and used
- a qualitative follow-up stage to explore some of the issues arising from the survey in more depth



Main findings:

- a little over half of the food businesses sampled were aware of the guidance, and 80% of butchers were aware, in keeping with the practice of enforcement officers prioritising these businesses
- around half the food business agreed that their awareness of the risks of cross-contamination has been enhanced by the guidance materials
- almost one-third of businesses, particularly butchers, had introduced change as a result of the guidance
- while many businesses have faced challenges, including financial and time costs, when implementing change, virtually all businesses also acknowledged benefits associated with change, including reduced health risks and staff having a clearer idea of their responsibilities
- two-thirds of both enforcement officers and food businesses described the guidance as easy or very easy to understand
- some suggestions for improvements were made, such as the use of more practical examples

One-third of local authorities said that no improvements to the guidance were necessary. However, among those who did suggest changes, the most common suggestions were to include more practical examples in the guidance (23%) or to provide clearer language and better explanations of terminology (17%).

Over the next year we will be reviewing how the guidance can be amended, to improve the content, ease of understanding, and provision of support material. We will also investigate other control options proposed by industry. A research body has now been appointed. It will be inviting food businesses and other stakeholders to contribute information about alternative controls for *E. coli* O157, which will be assessed and evaluated to see if they are appropriate to be carried forward for further testing. We will also consider ways to raise awareness and understanding, particularly in start-up, small and ethnic minority businesses.

#### 4.6 Cross-cutting and strategic research

One of the ways we track people's attitudes and reported behaviours towards food is through the 'Food and You' survey. This collects robust quantitative data to allow comparison of attitudes and reported behaviours relating to food safety issues between different groups within the population.<sup>100</sup> The results from the second wave of interviews conducted in 2012, which build on the results from the first wave, were published in March 2013. The majority of respondents reported domestic food safety practices that were in line with Agency guidance. This was especially the case for cleaning and cooking practices but less likely to be the case for chilling practices.

The second wave of the 'Food and You' survey also includes the development of an index of recommended practice for food safety, which has been used to explore socio-demographic differences in reported food safety practices in the home. Some of the specific findings regarding how well individuals follow Agency guidance are provided in Chapter 1. Subsequent waves of data from the 'Food and You' survey will enable us to monitor changes in people's attitudes, knowledge and reported behaviour over time.

The Agency also funds the biannual 'Public Attitudes Tracker' survey to monitor changes in consumer attitudes towards food-related issues. The results from the fifth wave were published in February 2013.<sup>101</sup>

Where there is a need to explore consumer responses to specific issues to help inform UK policy, we fund more detailed consumer research.

#### Consumer views on labelling of genetic modification in food

The Agency funded a study to explore the public's views on the labelling of genetic modification (GM) in food, and options for labelling food as GM-free. The results of this research were published in January 2013.<sup>102</sup> See the text box on the next page.

## In focus

### Exploring public responses to the labelling of GM food and the use of GM-free labelling

Some EU countries have introduced schemes to allow producers to label products as 'GM-free' or 'without GM'. However, the products that carry these labels do not need to be completely free from the use of biotechnology, as these schemes may tolerate some GM materials, such as low level adventitious presence, or use of certain GM additives.



Qualitative research was used to explore the breadth of views on the labelling of GM food, including from those who are less engaged on the issue. Data were collected in response to selected questions in a follow up quantitative stage.

The overall awareness of any existing labelling of GM foods among study participants was low. Participants generally did not seek information or labelling with regard to GM foods.

Results:

- Although there was divided opinion on whether the ideal labelling solution should be to highlight the presence or absence of GM material, information regarding GM presence tended to be considered more important and participants thought they had a 'right to know'.
- Labelling of foods to indicate the absence of GM ingredients may result in a range of expectations. For example, there were assumptions that a product labelled as 'GM-free' would not allow for any tolerance threshold for accidental or adventitious GM material (such as the 0.9% tolerance level that was generally accepted for mandatory GM labelling). This was confirmed by the quantitative research, where 68% of respondents who had heard of the use of GM supported this view.



- Although there was low or no awareness of current GM labelling requirements, there was a strong assumption among participants that products containing GM ingredients would be regulated and labelled.
- Participants were generally unaware of the use of GM animal feed by farmers. However, once made aware they typically considered that products from animals fed GM feed should be labelled, which is consistent with the findings from previous Agency-funded research.<sup>103</sup>
- Although a range of knowledge of GM existed among participants, attitudes towards it were fairly undeveloped and knowledge levels were quite low overall. This low level of understanding appears to be supported by the quantitative research, where only 8% of respondents that had heard of the use of GM claimed to have good knowledge of the use of GM in food or food production.

Discussions will take place at a European level in 2013, when the results of a Europe-wide review will be available. We will use the results of our research to ensure that the public's views are reflected in these discussions.



# Chapter 5: Our science and evidence strategy

## Priority activities

Our Science and Evidence Strategy to 2015, sets out how we will use science and evidence to meet the challenges of delivering safer food for the nation.<sup>104</sup> It sets out our strategic priorities for the evidence we will need and the activities we will undertake to make sure we obtain and use that evidence effectively, to support delivery of our Strategic Plan to 2015, measure progress, inform development of our future strategy, and support our ability to deliver in the long term.

It includes the five priority activity themes, which outline the actions we will take to obtain and use evidence effectively:

- identifying and obtaining the evidence we need
- partnerships
- interpretation, knowledge transfer and translation
- appraisal and evaluation
- knowledge, skills and capabilities

The actions we are taking under each of these priority activities are described in the following sections.



BACK TO  
CONTENTS

## 5.1 Identifying the evidence we need

We use the following range of sources to identify needs for new evidence.

**Figure 16** Sources of evidence



Once a knowledge gap is identified, a business case for the proposed work is developed. If agreed, it is included in the Forward Evidence Plan which outlines science and evidence activities prioritised using the process described in the Science and Evidence Strategy. The 2013/14 plan includes potential areas for research funding and workshops.<sup>105</sup> The plan was published on our website to allow other funders and potential contractors to identify:

- synergies where we could work in partnership
- possible overlap or duplication with work already funded or planned
- possible refinements to the evidence requirements to improve the chances of better proposals

Unforeseen developments or opportunities will be addressed at other stages during the year through the advertisement of ad-hoc requirements.

Future research topics are also identified through the expert workshops that we organise. Some recent examples include: a workshop held on the application of molecular epidemiology to investigations of foodborne disease outbreaks;<sup>35</sup> and a conference on foodborne viruses<sup>21</sup> (see Chapter 1 for more information).

## 5.2 Partnerships

We recognise the importance of continuing to work in partnership wherever we can. In the past year 11% of our total science and evidence-gathering expenditure was on co-funded projects. Joint working ensures we work effectively and achieve value for money. It also helps us to develop coherent, holistic approaches, identify synergies and avoid duplication of activity.

Notable examples of partnerships include: our work on campylobacter, together with the British Biotechnology and Biological Sciences Research Council (BBSRC), Defra and others;<sup>106</sup> the Global Food Security (GFS) programme; and a strategic partnership with the Economic and Social Research Council (ESRC) to fund activities, which aim to develop the social science evidence base on issues around food.<sup>107</sup>

We are also exploring new and innovative ways of developing partnerships. In July 2012, we announced our intentions to fund two five-year early-career fellowships in food safety with the BBSRC.<sup>108</sup> By supporting scientists who wish to pursue research into areas such as combating foodborne diseases or emerging issues affecting food safety, we aim to foster collaboration and interaction between the fellows and the Agency. Successful candidates will be allocated a mentor from the Agency and from the BBSRC, and they will work with us and will be encouraged to use their research expertise to contribute to relevant policy initiatives. Unfortunately we were unsuccessful in identifying suitable candidates this time around, but we intend to work with the BBSRC further on this important initiative. Opportunities to support fellowships with ESRC are also being investigated.

During the past year we granted a scholarship to a student to undertake a three-year programme in veterinary public health.<sup>109</sup> The appointed candidate will undertake a Master of Science qualification and will work at the Agency and the Royal Veterinary College. They will conduct collaborative research in topics related to food safety, such as slaughterhouse factors affecting the level of campylobacter contamination on poultry carcasses and the definition of potential indicators that could inform the levels of general hygiene in the slaughterhouse. The student will also provide support to other areas within the Foodborne Disease Strategy, such as the programme to reduce human cases of *Listeria monocytogenes*.

We continue to co-operate with and co-fund work under the European Union's multi-billion Framework Programmes on research, where projects have strong links to our needs.<sup>110</sup> Such projects are usually large scale and address complex issues. Our relatively modest contributions provide good value for money in accessing important findings and international expertise. We expect to co-fund further work under the Horizon 2020 programme, which is the successor to the Framework Programmes due to run from 2014 to 2020.<sup>111</sup>

### 5.3 Interpretation, knowledge transfer and translation

#### Science governance

Good science governance is fundamental to the work of the Agency. We place great importance on our evidence being analysed, used and communicated effectively and properly. Our General Advisory Committee on Science (GACS) provides independent expert advice and challenge on these activities.

We carried out a review of science governance in the Agency in 2012. This identified a number of potential improvements, which were discussed and agreed by the Board in July 2012. The Board was generally reassured that the correct processes are in place to ensure that we have the science we need to develop and deliver effective policies to protect consumers, see the text box below.<sup>112</sup>

#### In focus

#### Review of science governance in the Agency

The review did not identify any major concerns or weaknesses, however, it did identify seven areas where there is scope to build on our current processes.

We have taken the following actions to address the areas for improvement to help ensure that science governance in the Agency is clear, effective and consistent:



#### **A clear framework for science governance in the Agency**<sup>113</sup>

A framework was published to communicate our approach to underpin consistent practice in the Agency.

#### **Tools and guidance that support the use of good practice**

The Science Checklist is a tool that underpins our science governance.<sup>114</sup> It outlines the points to be considered in the preparation of papers and proposals that deal with science-based issues or which draw on advice from the Scientific Advisory Committees (SACs). Although the Checklist was considered fit for this purpose, the review identified ways in which its use and scope should be expanded. The Checklist, and the accompanying good practice guidelines, which set out the principles by which the SACs work, were both updated following the review.



### **Checklists for risk assessment in incidents**

The Agency's Incidents Protocol provides brief pointers on risk assessment in food incidents.<sup>115</sup> To help to ensure a consistent approach across different incidents, two additional checklists have been developed for internal use to set out in more detail the issues that a risk assessment in an incident may need to consider.

### **An 'evidence' section in templates for Board and internal policy papers**

A section for 'evidence' has been included in the templates for Board and internal policy papers, to make more explicit the main underpinning evidence and analysis.

### **Early discussion on science and evidence needs for new policy papers and projects, between policy leads and the Chief Scientist Team**

The 'evidence' section in the template will help ensure papers and new policy projects clearly set out the evidence base for proposals at the outset. We have developed guidance on the needs for, and approaches to scientific evidence for new papers and significant policy projects.

### **A clear, consistent framework for dialogue and iteration between the Agency and the Scientific Advisory Committees (SACs)**

A framework which sets out the agreed objectives and boundaries for dialogue and iteration between the Agency and SACs has been agreed.<sup>116</sup> Dialogue should happen at all stages, should be transparent, and should respect the distinct roles of the SACs in providing independent advice of risk assessment and other science issues, and of the Agency in policy and decision-making.

Internal discussions with the SAC secretariat at the start of new pieces of work that require SAC input will ensure that there is a clear and consistent approach to the questions in the framework.

### **Working with others to develop and share good practice**

We will continue to work with others to identify, share and spread good practice in science governance, including with Chief Scientific Advisors and SACs in the UK, and with our opposite numbers internationally.

A good example of our international work is the part we played in co-ordinating a Working Group of the network of the Heads of National Food Agencies across Europe. The Working Group considered the transparent use of risk assessment in decision making. See Chapter 3 for more information about the Working Group's recommendations, as outlined in the report, which was published in 2012.



Professor Anne Glover, the Chief Scientific Advisor to the President of the European Commission, has emphasised the need to speak up when science has been misused. At an EFSA conference in 2012, she said policy-makers should be transparent about their motivation when they ignore scientific evidence. She gave an example, where certain member states have consistently voted against the use of GM crops, despite these crops having passed safety assessments in the EU.

EFSA has also launched a new initiative to make data used in risk assessment publicly available, as part of its commitment to improve transparency.<sup>117</sup> This is in line with our own requirement for data from our science and evidence-gathering research to be made publicly available in an accessible format.<sup>118</sup> EFSA has recently made the full datasets on genetically modified maize submitted in the approval process in 2003 publicly available on its website, given the level of public interest.

#### 5.4 Appraisal and evaluation

All of our policy development is based on science and evidence, and we consider it important that the work undergoes full appraisal and evaluation.

The General Advisory Committee on Science (GACS) recommended we establish a register of specialists, to give greater structure and to broaden the range of expertise available for activities such as peer review of research findings, question framing and evaluation. This complements the expertise available through the advisory committees. We have a basic central register in place, and work is underway to broaden membership and to make more consistent use of these independent experts, so that we engage with them for expert commentary and opinion on science topics.

#### Evaluation of the food hygiene standards initiative

Our in-house social science experts advise us on the assessment of our policies. They are overseeing the independent work we are funding to provide a robust evaluation of the food hygiene standards initiative.

The Food Hygiene Rating Scheme (FHRS) for England, Wales and Northern Ireland, and the Food Hygiene Information Scheme (FHIS) for Scotland, are being introduced in partnership with local authorities. The schemes provide information on hygiene standards in food businesses to help consumers choose where to eat out or shop for food. The aim is to encourage food businesses to improve standards and, in turn, reduce the incidence of foodborne disease. Businesses included in the FHRS are rated on a scale from '0' at the bottom to '5' at the top. Food outlets in Scotland are given a 'Pass', or 'Improvement required' inspection result.

We sought independent advice on how best to evaluate the FHRS/FHIS. An independent advisory group has been set up to oversee the evaluation exercise that we have commissioned and to review key outputs and fieldwork materials. The evaluation

is underway and early findings were reported over the past year.<sup>119</sup> See the text box below.

## In focus

### An evaluation update on the Food Hygiene Rating Scheme (FHRS) and Food Hygiene Information Scheme (FHIS)

There are two parts to the evaluation:

- a process study
- an impact study



These are designed to:

- explore how the schemes are being implemented
- see if they are operating as intended
- assess the impact on consumers, businesses and local authorities
- assess the impact on business compliance levels and on public health

The process study is being conducted in two stages:

**Stage 1**, which is now complete, considered early implementation of FHRS and FHIS when the schemes were still relatively new, when many local authorities were still operating 'local' hygiene schemes and before we had started to implement our national communications strategy.

The practical issues involved in setting up FHRS and FHIS and in operating the schemes were explored from the perspective of local authorities. This was followed by a consideration of the schemes from the perspective of the two main target groups which the FHRS/FHIS intend to influence: food businesses and consumers.

The main findings are:

- Local authorities: FHRS/FHIS was viewed as a tool to enhance their enforcement role which would be further strengthened if display of ratings by food businesses became mandatory.



- Consumers: Awareness of the scheme was generally low at this stage. However, there was evidence of the FHRs influencing those who had some awareness of the scheme, and support for mandatory display.
- Food businesses: Few food business operators fully understood the details of the scheme, but there was evidence that some had made changes and improved their rating.

**Stage 2** of the evaluation extends into 2014 to 2015 and will continue to provide evidence to help assess the effectiveness of the schemes. It will take account of policy developments such as the introduction of the Food Hygiene Rating (Wales) Act 2013.<sup>120</sup> This requires mandatory display of ratings at premises and is expected to come into force in late 2013.

These findings will be used to further develop our package of support for local authorities operating the FHRs and FHIS and the ongoing communications strategy. They will also inform policy development.

## 5.5 Knowledge, skills and capabilities

We need to maintain and develop the knowledge, skills and capabilities required to deliver our science and evidence objectives, both within the Agency and externally.

### Scientific advisory committees

Eight scientific advisory committees (SACs) provide us with the independent advice and challenge that is fundamental to our work and reputation.<sup>121</sup> These independent committees help make sure that the Agency's advice is always based on robust analysis of the most recent scientific evidence. Seven of the SACs cover specific food and feed related issues such as microbiology, social science and toxicology. The General Advisory Committee on Science (GACS), which brings together the work of the other committees, has a broader, more strategic role to advise on our science. We also seek the advice of several other scientific committees when needed.

The SACs are reviewed regularly, to make sure they are delivering useful advice to the Agency and are fulfilling this role, effectively and properly. The independent review of the committees has continued in the past year, with reviews of the Advisory Committee on Novel Foods and Processes (ACNFP)<sup>122</sup> and of GACS<sup>123</sup> (see the text box on the next page) completed in 2012. In both cases the reviews concluded an ongoing need for the committees, with value for the Agency and for other organisations, and that the support provided by their secretariats is of a high standard. They each offered recommendations for how the committees can maximise the value of their work. Our response to both of these reviews, prepared in discussion with the SAC secretariats, was agreed by the Board in July 2012.<sup>124</sup>





## In focus

### Review of the General Advisory Committee on Science

The response from the General Advisory Committee on Science (GACS) to the review has been published<sup>123</sup> and the following actions have been taken:



- The recommendation to include the work plan for the year ahead as a discussion item at meetings was agreed. This has now been implemented.
- There was not a sufficiently clear argument for recruiting an additional GACS member with industrial experience, having priority over other areas of special knowledge and expertise. GACS suggested that the planned recruitment should address the current vacancy for an expert member with nutrition expertise as the focus, but that the advertisement could include experience of having worked in the food industry as a desirable rather than essential quality.
- GACS agreed that there should be an open invitation to Board members to attend GACS meetings, and Board members have in the past attended some meetings. GACS agreed it could also be valuable for its members to attend open Board meetings, or to view them online. SAC chairs already attend Board meetings where their committee's advice forms part of the evidence base for discussion.
- The secretariat will draft an update from the GACS chair to the Board following each GACS meeting, to go to the next available Board meeting.
- The GACS dinners will be reinstated as forums for more informal discussion and an opportunity to meet senior Agency staff.
- People with different experiences could require different approaches to induction and different induction material, so the process would need to be tailored to the individual.

A report of the quinquennial review of the Social Science Research Committee, carried out in the past year, will be reported later in 2013.

# Chapter 6: Outlook

## What does the future hold?

### 6.1 The coming year

Following the 2012 review of the Agency's Strategy to 2015, the Board agreed we need to press on with our main initiatives. However, it was agreed there should be more emphasis to show that we put the health of consumers first. There would also be a change to reflect that business compliance and economic growth is effectively supported, because it delivers consumer protection. This will include a focus on effective, risk-based and proportionate regulation and enforcement. The review confirmed our priority activities in the strategy relating to food safety, consumer protection or consumer information remain important. The Board agreed the favoured approach to achieving the outcomes, is to work in partnership wherever we can, and this will be reflected in the revised strategy.

The strategy review identified that reducing the incidence of campylobacter remains a top strategic priority. Given the intractability to date of decreasing the incidence of infection with this organism, we will be reviewing our approach to this issue with the Board, and adjusting our intervention plan with industry and other stakeholders.

Another priority area is the implementation of the Food Hygiene Rating Scheme and Food Hygiene Information Scheme in partnership with local authorities across the UK. Our evaluation of these schemes in terms of their impact on consumers, on local authorities, on food businesses, on food hygiene compliance and on public health, will help inform our strategic objectives for these schemes in the future.

Over the coming year we propose activities in the following areas:

- microbiological food safety, including campylobacter, *E. coli*, listeria and norovirus
- a range of issues related to food and feed hygiene policy
- chemical safety of food, including metals and organic contaminants
- the next round of the strategic challenge call



- diet and health related work funded by the Agency in Scotland and Northern Ireland

## 6.2 Identifying risks

It is important that we take a co-ordinated approach to intelligence gathering and work on identifying emerging risks. To help us make predictions about potential future food safety risks, we examine how we can use more creatively and effectively the data we generate, and the data we gather from other sources. By sharing this information and improving our work with partners, we aim to develop a more innovative and proactive approach to food safety management.

The National Intelligence Model provides us with a structured approach to the assessment of the intelligence that is gathered. Specialist IT software offers opportunities for us to use these data in a more effective manner to predict future risk. This could be by, for example, identifying signals pertaining to unusual events that may be the precursors of future food safety issues.

We have established a large number of formal and informal networks at local, national and international levels. These help provide opportunities for intelligence gathering and sharing, through collaborative working with industry, enforcement authorities and international partners such as the European Food Safety Authority. The core intelligence that we use to help us identify future risks is derived from the statistical analysis of historical incident and food fraud data, as well as from reports from the European Commission's Rapid Alert System for Food and Feed.<sup>86</sup> In addition, we have a large number of other sources of information available for scrutiny, including research and surveillance data, media reports and expert opinion. Outputs from horizon scanning activities provide further intelligence that helps us understand the key drivers that might affect food safety in the future.

## 6.3 Root cause analysis

Analysis of food safety incidents has shown that certain types of incident seem to recur regularly. This suggests that the corrective actions taken are not always sustainable or appropriate and are, therefore, not providing long-term preventative solutions. To address this, we work with industry partners to develop methods for identifying the root causes of food safety incidents.

We use a technique called root cause analysis to look at the events leading up to a food safety incident, finding out why things happened at each stage. It can identify the chain of events, as well as the specific step or series of steps within that chain where action could be taken to prevent similar food safety incidents in the future. We believe that this technique will also be valuable to food business operators and enforcement colleagues and we intend to put together a training package. If a number of root causes of similar issues are aggregated and considered together, emerging themes relating to underlying issues might then be uncovered. For example, the analysis of incidents involving undeclared sulphites has shown that 90% of the incidents were caused by poor or

insufficient training of food business operators and their staff, resulting in lack of knowledge of either the product or the appropriate labelling requirements. This innovative approach is now enabling us to make more intelligence-led decisions relating to the management of food safety incidents and to enable us to predict and respond earlier to future food safety issues.

#### **6.4 Tackling food fraud**

Food fraud is committed when food is deliberately placed on the market, for financial gain, with the intention of deceiving the consumer. Food fraudsters find greater opportunities for defrauding the public during times of economic difficulty, and tackling them is a key objective of our Strategic Plan to 2015. We work closely with local authority trading standards, environmental health and port health officers to identify potential food fraud, and we help them investigate and prosecute those responsible.

The national food fraud database is an important resource for detecting emerging patterns of fraudulent activity, and for local authorities seeking information to assist with their investigations into food fraud incidents. An increasing volume of food fraud intelligence is being received from a variety of sources, including local authorities, consumers, industry, government departments and other enforcement bodies.

The Agency has developed techniques to help identify links in cases involving the fraudulent supply of products, such as vodka, and this has allowed us to take action, in conjunction with police and enforcement partners, to identify and remove those products from sale.

Not surprisingly the number of intelligence reports we received rose considerably during January to March 2013, at the height of the horse meat incident, resulting in follow-up checks at local authorities and Agency registered/approved establishments, as appropriate. See Chapter 3, section 3.4 for more information about the Agency's investigation into this incident.

The international investigation into the presence of horse meat in products labelled as beef, following the incident, highlights the importance of counter-fraud work. Although enquiries are still under way and several trails are being pursued, the indications are that fraud has taken place where the findings suggest gross contamination of beef products.

#### **6.5 Horizon scanning**

The Centre for Environmental Risk and Futures (CERF) at Cranfield University is a Defra-led partnership that includes the Agency.<sup>76</sup> Funding began in April 2011 for an initial period of three years. CERF provides horizon scanning and futures studies across the food and environment areas, to help us identify opportunities and address potential new threats, to deliver safer food in the long-term. A large project on 'plausible futures scenarios for the UK food and feed system for 2015 and 2035' is underway.



We can use experts at CERF to help with specific pieces of work, such as expert facilitation for workshops and input into scenario development. Analysis on more specific topics, such as the identification of the features and attributes of our supply chains, enables us to map the potential risks associated with each stage from farm to fork. Information from CERF's horizon scanning activities can then be used to help us understand how changes which affect weaknesses in the global chain might occur, and how potential new issues might arise as a possible hazard develops into a risk.

The majority of checks on imports are carried out when food has crossed the UK border. We are considering how we might identify risks closer to the source and to use this information to target checks at the UK/EU border. We are funding research to evaluate the effectiveness of assurance schemes and the role they could play in the delivery of official controls at the UK borders.<sup>125</sup> The main focus is fresh, perishable commodities such as fruit and vegetables, but the research will also touch on the farm to fork principles and potential weakness at the various stages along the chain. The research includes a literature review of third party 'assurance' schemes. Initial indications suggest that some (but not all) of these schemes are focused heavily on areas outside of food safety. We will need to consider this going forward to establish whether those particular schemes are robust and reliable enough to inform official controls.

In terms of food safety, we need to consider where resources should be placed in order to control risk. Using the example of campylobacter in chicken, should greater resources be placed in reducing the incidence of campylobacter, or in advising consumers on more appropriate cooking methods?

As noted in section 6.4 above, the problem of food fraud is likely to increase as food prices rise. This was discussed at the Economic and Social Research Council (ESRC) Public Policy Seminar in March 2012,<sup>126</sup> where the following issues were raised:

- Is it better to put resources into identifying fraud and enforcement services or into raising public consciousness regarding the problem of food counterfeiting and fraud?
- How could technology be used to speed up the identification of fraud?
- How to anticipate problems and better understand risks.

## 6.6 Global food supply chain

We study global food supply chains to enable mapping of the potential risks associated with each stage in the chains, from farm to fork, including the individual processes used to manufacture food products. By understanding the features and attributes of each supply chain and what can occur at each stage, we can check for any unexpected changes that might provide early warning of new issues. For example, we investigate how the current global economic situation and changes in the patterns of global food sourcing are impacting on food safety, resulting in the increased number of incident reports that we have seen in recent years.



The Global Food Security (GFS) programme is a multi-agency partnership bringing together the research interests of the research councils, executive agencies and government departments.<sup>127</sup> The GFS programme aims to help provide the evidence needed to meet the challenge of providing the world's growing population with a sustainable, supply of safe, nutritious food from less land and with fewer inputs, and considers both supply-side and demand-side.\*

The role of the GFS programme is to ensure that strategically important research in these areas is undertaken, and to add value to research via interdisciplinary collaboration, alignment and engagement of different stakeholder groups. The Agency is providing strategic input on the topic of sustainable, healthy, safe diets. Food safety is a cross-cutting issue that cuts across the food supply chain – from the environment through production, manufacturing and retail, to access and choice of food and its impacts on human health, nutrition and well-being. A significant proportion of our science and evidence-gathering activity aligns with and supports the aims of the GFS programme, for instance our co-funded work on campylobacter.

Professor Tim Benton, the Champion for the GFS programme, provides an important link between funders, the research community, the public and users of research.

## In focus

### Global Food Security programme

The Global Food Security (GFS) programme was formally launched in February 2011<sup>127</sup> and significant momentum has developed since Professor Tim Benton was appointed as Champion in November 2011. The programme's activity can be categorised into three broad strands:

**Strand 1:** GFS conducts a range of horizon scanning and scoping activities to identify significant knowledge gaps. These exercises may both influence the research agenda within individual partners, and/or if there is a significant need for multi-partner support, research may be developed into cross-partner funded programmes. Examples of the scoping exercises include:

- extreme weather and food chain resilience



\* It is implicit in this top line goal that a sustainable supply of safe and nutritious food, requires both supply-side (food production) and demand-side (for example, reducing waste, modifying consumption patterns) interventions.

- engineering solutions for agriculture
- consumer choice and its impacts on health and nutrition
- waste throughout the supply chain
- identifying the 100 key research questions

GFS is investing in cross-partner programmes in a number of new areas, including in the areas of soils, drought and platforms for research in sustainable intensification. It aims to develop more programmes as the scoping exercises in progress identify important needs.

**Strand 2:** GFS is an important broker of knowledge from the research community for governments in the UK. The GFS secretariat contributes to a range of projects, for example: Defra's Green Food Project; GO-Science's Food Research Partnership; and the UK Water Research and Innovation Partnership. It has contributed evidence to select committees, and regularly adds value to discussions at All Party Parliamentary Groups. Representatives sit on senior level research committees in Westminster and Scottish Governments, and are often asked for specific advice on issues as they arise.

**Strand 3:** GFS is an increasingly important broker of knowledge from research to the wider stakeholder community. GFS representatives give many seminars and presentations to the public and to different industry and academic groups. They work closely with a range of industrial working groups to develop key messages and help industry apply them. They have conducted public dialogues and have a travelling exhibition, and the GFS blog site<sup>128</sup> is well regarded both here and abroad. In addition, GFS will soon be launching a series of 'policy and practice notes' to put research information in the public domain.

Partners in the Global Food Security (GFS) Research Partnership came together in March 2012 to hold a public policy seminar to discuss issues surrounding global food systems and the importation of food into the UK.

The report from this event on 'Global Food Systems and UK Food Imports – Resilience, Safety and Security', which we co-funded with the Economic and Social Research Council (ESRC), Defra and the Scottish Government, was published in March 2013.<sup>126</sup> It recommends a set of research priorities to ensure safe, sustainable and resilient food imports, including:

- placing a social science perspective at the heart of research initiatives
- exploring how global population growth, urbanisation, environmental change and changing economic climates will affect UK food demand and other countries' capacity to meet this demand



- understanding the potential impacts of increased new technology on the nutritional and safety aspects of food
- studying consumer behaviours and food waste; up to one third of the food purchased by UK consumers is being thrown away

Food security and sustainability are closely linked with global factors. Over the coming year we will continue to give food safety proper consideration in cross-cutting initiatives in these areas.



# Glossary of Terms

<b>ACMSF</b>	Advisory Committee on the Microbiological Safety of Food
<b>ACNFP</b>	Advisory Committee on Novel Foods and Processes
<b>ATP</b>	Adenosine-triphosphate
<b>BBSRC</b>	Biotechnology and Biological Sciences Research Council
<b>CCIR</b>	Collection and Communication of Inspection Results
<b>CEN</b>	Comité Européen de Normalisation – European Standardisation Organisation
<b>CERF</b>	Collaborative Centre of Excellence for Natural and Environmental Risks and Futures at Cranfield University
<b>Defra</b>	Department for Environment, Food and Rural Affairs
<b>DH</b>	Department of Health
<b>DNSIYC</b>	Diet and Nutrition Survey of Infants and Young Children
<b><i>E. coli</i></b>	<i>Escherichia coli</i>
<b>e-FOSS</b>	Electronic Foodborne and non-Foodborne Gastrointestinal Outbreak Surveillance System
<b>EFSA</b>	European Food Safety Authority
<b>EHO</b>	Environmental Health Officer
<b>ESBL/AmpC</b>	Extended-spectrum beta-lactamases/class C gram negative beta-lactamases
<b>ESRC</b>	Economic and Social Research Council
<b>EU</b>	European Union
<b>FAO</b>	Food and Agricultural Organization of the United Nations
<b>FBO</b>	Food Business Operator



<b>FCI</b>	Food Chain Information
<b>FDA</b>	Food and Drug Administration (USA)
<b>FHIS</b>	Food Hygiene Information Scheme
<b>FHRS</b>	Food Hygiene Rating Scheme
<b>FSAI</b>	Food Safety Authority of Ireland
<b>FVO</b>	Food and Veterinary Office
<b>GACS</b>	General Advisory Committee on Science
<b>GFS</b>	Global Food Security
<b>GM</b>	Genetically Modified
<b>GMI</b>	Global Microbial Identifier
<b>GO-Science</b>	Government Office for Science
<b>HPA</b>	Health Protection Agency (now Public Health England)
<b>HPS</b>	Health Protection Scotland
<b>ICP-MS</b>	Inductively Coupled Plasma Mass Spectrometry
<b>IgE</b>	Immunoglobulin E
<b>IID</b>	Infectious Intestinal Disease in the Community Study
<b>JECFA</b>	Joint FAO/WHO Expert Committee on Food Additives
<b>LAEMS</b>	Local Authority Enforcement Monitoring System
<b>LOCOG</b>	London Organising Committee of the Olympic Games
<b>NDNS</b>	National Diet and Nutrition Survey
<b>NHS</b>	National Health Service
<b>NMES</b>	Non-Milk Extrinsic Sugars
<b>NoroCORE</b>	National Institute of Food and Agriculture Food Virology Collaborative project (USDA)
<b>OV</b>	Official Veterinarian
<b>PEDW</b>	Patient Episode Database for Wales
<b>PHA</b>	Public Health Agency (Northern Ireland)
<b>PHE</b>	Public Health England
<b>RASFF</b>	Rapid Alert System for Food and Feed
<b>RNA</b>	Ribonucleic acid
<b>RNPs</b>	Ribonucleoprotein complexes

<b>RT-qPCR</b>	Reverse Transcription Quantitative Polymerase Chain Reaction
<b>SAC</b>	Scientific Advisory Committee
<b>TSE</b>	Transmissible Spongiform Encephalopathy
<b>UKFSS</b>	United Kingdom Food Surveillance System
<b>USDA</b>	United States Department of Agriculture
<b>VTEC</b>	Verocytotoxin-producing <i>Escherichia coli</i>
<b>WHO</b>	World Health Organization

## References

- 1 Food Standards Agency (2001): *Report of the study of infectious intestinal disease in England*  
[food.gov.uk/science/research/foodborneillness/microfunders/intestinal](http://food.gov.uk/science/research/foodborneillness/microfunders/intestinal)
- 2 Food Standards Agency (2011): *FS231043 The second study of infectious intestinal disease in the community (IID2)*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/b18021/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/b18021/)
- 3 Food Standards Agency (2011): *Foodborne disease strategy*  
[food.gov.uk/policy-advice/microbiology/fds/](http://food.gov.uk/policy-advice/microbiology/fds/)
- 4 Department for Environment, Food and Rural Affairs (2013): *National control plans for the reduction of salmonella*  
[defra.gov.uk/animal-diseases/a-z/salmonella/](http://defra.gov.uk/animal-diseases/a-z/salmonella/)
- 5 Food Standards Agency (2008): *Management of outbreaks of foodborne illness in England and Wales*  
[food.gov.uk/foodindustry/guidancenotes/hygguid/outbreakmanagement](http://food.gov.uk/foodindustry/guidancenotes/hygguid/outbreakmanagement)
- 6 Food Standards Agency (2011): *Campylobacter risk management programme*  
[food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/](http://food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/)
- 7 Food Standards Agency (2011): *Joint Working Group on Campylobacter*  
[food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/](http://food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/)
- 8 Food Standards Agency (2011): *Research and development on campylobacter*  
[food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/](http://food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/)
- 9 Food Standards Agency (2013): *Eggs and poultry research programme*  
[food.gov.uk/science/research/foodborneillness/eggsresearch/b15programme/](http://food.gov.uk/science/research/foodborneillness/eggsresearch/b15programme/)



- 10 Food Standards Agency (2012): *A quantitative assessment of consumers' understanding of campylobacter and attitudes towards decontamination treatments*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241052/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241052/)
- 11 Food Standards Agency (2013): *An evaluation of freezing as an intervention to reduce the numbers of campylobacters isolated from chicken livers*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs101025/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs101025/)
- 12 Food Standards Agency (2013): *A microbiological survey of campylobacter contamination in fresh whole UK produced chilled chickens at retail sale*  
[food.gov.uk/science/research/foodborneillness/eggsresearch/b15programme/b15projects/fs241044/](http://food.gov.uk/science/research/foodborneillness/eggsresearch/b15programme/b15projects/fs241044/)
- 13 Food Standards Agency (2011): *Listeria Risk Management Programme*  
[food.gov.uk/policy-advice/microbiology/listeria/](http://food.gov.uk/policy-advice/microbiology/listeria/)
- 14 Food Standards Agency (2013): *Preventing listeriosis in hospitals and nursing/ care homes*  
[food.gov.uk/policy-advice/microbiology/listeria/listeria-care-settings](http://food.gov.uk/policy-advice/microbiology/listeria/listeria-care-settings)
- 15 Food Standards Agency (2012): *FS425012 Review of current practices in the management of Listeria monocytogenes in smoked fish production in Scotland and Northern England*  
[food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs425012/](http://food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs425012/)
- 16 Food Standards Agency (2012): *UK-wide microbiological survey of pre-packed ready-to-eat sliced meats at retail sale in small-to-medium enterprises (SMEs) with particular reference to the presence of Listeria monocytogenes*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241042/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241042/)
- 17 Food Standards Agency (2013): *A comprehensive review of current practices in the management of L. monocytogenes during the production of cooked, sliced meat*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241045/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241045/)
- 18 Food Standards Agency (2012): *Research call: norovirus*  
[food.gov.uk/news-updates/news/2012/oct/research-call-norovirus](http://food.gov.uk/news-updates/news/2012/oct/research-call-norovirus)
- 19 Food Standards Agency (2012): *FS101036 A critical review of methods for distinguishing infectious and non-infectious norovirus*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs101036/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs101036/)

- 20 Food Standards Agency (2012): *FS241027 System dynamics model for norovirus*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241027/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241027/)
- 21 Food Standards Agency (2013): *Foodborne viruses research conference*  
[foodbase.org.uk/results.php?f\\_report\\_id=806](http://foodbase.org.uk/results.php?f_report_id=806)
- 22 Food Standards Agency (2013): *A systematic review of the survival of norovirus in foods and on food contact surfaces*  
[food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241043/](http://food.gov.uk/science/research/foodborneillness/foodbornediseaseresearch/b14programme/b14projlist/fs241043/)
- 23 Public Health Agency (2012): *Home page*  
[publichealth.hscni.net/](http://publichealth.hscni.net/)
- 24 Food Standards Agency (2012): *Reminder to food handlers with food poisoning*  
[food.gov.uk/news-updates/news/2012/oct/food-handlers](http://food.gov.uk/news-updates/news/2012/oct/food-handlers)
- 25 Food Standards Agency (2012): *Hygiene reminder following NI E. coli outbreak*  
[food.gov.uk/news-updates/news/2012/oct/hygiene-reminder](http://food.gov.uk/news-updates/news/2012/oct/hygiene-reminder)
- 26 Welsh Government (2009): *The public inquiry into the outbreak of E. coli O157 in South Wales*  
[wales.gov.uk/ecoliinquiry/report/?lang=en](http://wales.gov.uk/ecoliinquiry/report/?lang=en)
- 27 Food Standards Agency (2012): *FS245004 Evaluation of interventions – Qualitative review of food safety regulatory decision-making study*  
[food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs245004/](http://food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs245004/)
- 28 Food Standards Agency (2011): *E. coli O157: control of cross-contamination*  
[food.gov.uk/business-industry/guidancenotes/hygguid/ecoliguide](http://food.gov.uk/business-industry/guidancenotes/hygguid/ecoliguide)
- 29 Food Standards Agency (2012): *FS245013 Evaluating FSA guidance on cross-contamination*  
[food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs245013/](http://food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs245013/)
- 30 Food Standards Agency (2013): *Feasibility of introducing methods, in the UK, for reducing shedding of E. coli O157 in cattle*  
[food.gov.uk/science/research/foodborneillness/ecoliresearch/fs421009/](http://food.gov.uk/science/research/foodborneillness/ecoliresearch/fs421009/)
- 31 Food Standards Agency (2012): *International E. coli workshop*  
[food.gov.uk/news-updates/news/2012/aug/e.coli-workshop](http://food.gov.uk/news-updates/news/2012/aug/e.coli-workshop)
- 32 Food Standards Agency (2013): *Call for new research on E. coli in cattle*  
[food.gov.uk/news-updates/news/2013/feb/cattle.ecoli](http://food.gov.uk/news-updates/news/2013/feb/cattle.ecoli)
- 33 European Food Safety Authority (2011): *Scientific Opinion on the evaluation of the safety and efficacy of lactic acid for the removal of microbial surface contamination of beef carcasses, cuts and trimmings*  
[efsa.europa.eu/en/efsajournal/pub/2317.htm](http://efsa.europa.eu/en/efsajournal/pub/2317.htm)

- 34 Food Standards Agency (2013): *FSA publishes Food and You 2012 survey results*  
[food.gov.uk/news-updates/news/2013/mar/foodandyou2](http://food.gov.uk/news-updates/news/2013/mar/foodandyou2)
- 35 Food Standards Agency (2012): *Harnessing technology to pinpoint foodborne disease*  
[food.gov.uk/news-updates/news/2012/aug/ngs](http://food.gov.uk/news-updates/news/2012/aug/ngs)
- 36 Food Standards Agency (2012): *Professor Sarah O'Brien's speech on molecular epidemiology*  
[food.gov.uk/multimedia/webpage/obrien](http://food.gov.uk/multimedia/webpage/obrien)
- 37 Global Microbial Identifier (2013): *Homepage*  
[g-m-i.org/](http://g-m-i.org/)
- 38 UC Davis School of Veterinary Medicine (2013): *100K Foodborne Pathogen Genome project*  
<http://100kgenome.vetmed.ucdavis.edu/>
- 39 Department of Health (2012): *Public health*  
[gov.uk/government/topics/public-health](http://gov.uk/government/topics/public-health)
- 40 NHS Wales (2012): *Health in Wales, Nutrition*  
[wales.nhs.uk/healthtopics/lifestyles/nutrition](http://wales.nhs.uk/healthtopics/lifestyles/nutrition)
- 41 Department of Health (2013): *Public Health Responsibility Deal – PHRD launch document*  
[responsibilitydeal.dh.gov.uk/](http://responsibilitydeal.dh.gov.uk/)
- 42 Food Standards Agency (2012): *Statement on Scottish Government announcement on Food Standards Agency*  
[food.gov.uk/news-updates/news/2012/jun/scotgov](http://food.gov.uk/news-updates/news/2012/jun/scotgov)
- 43 The Scottish Government (2010): *Preventing Overweight and Obesity in Scotland: A Route Map Towards Healthy Weight*  
[scotland.gov.uk/Publications/2010/02/17140721/0](http://scotland.gov.uk/Publications/2010/02/17140721/0)
- 44 Public Health Agency (2012): *A Fitter Future for All – framework launched*  
[publichealth.hscni.net/news/fitter-future-all-framework-launched](http://publichealth.hscni.net/news/fitter-future-all-framework-launched)
- 45 Food Standards Agency (2011): *Food and You survey*  
[food.gov.uk/science/research/ssres/foodandyou/foodyou10](http://food.gov.uk/science/research/ssres/foodandyou/foodyou10)
- 46 Food Standards Agency (2013): *Caloriewise scheme*  
[food.gov.uk/northern-ireland/nutritionni/caloriewise/](http://food.gov.uk/northern-ireland/nutritionni/caloriewise/)
- 47 Food Standards Agency (2010): *Evaluation of a pilot intervention in Kent schools*  
[foodbase.org.uk/results.php?f\\_category\\_id=&f\\_report\\_id=402](http://foodbase.org.uk/results.php?f_category_id=&f_report_id=402)
- 48 Activ8 (2013): *Active8 Homepage*  
[activ8ni.net/](http://activ8ni.net/)

- 49 Food Standards Agency (2012): *Front-of-pack food labelling consultation*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/  
boardmeetings2012/121211/boardagenda121211](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/121211/boardagenda121211)
- 50 Food Standards Agency (2010): *Front-of-pack nutrition labelling*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/  
boardmeetings2010/100310/agenda100310](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/boardmeetings2010/100310/agenda100310)
- 51 Europa (2013): *New EU law on food information to consumers*  
[ec.europa.eu/food/food/labellingnutrition/foodlabelling/proposed\\_legislation\\_  
en.htm](http://ec.europa.eu/food/food/labellingnutrition/foodlabelling/proposed_legislation_en.htm)
- 52 Food Standards Agency (2013): *Minutes of Board meeting March 2013*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/#/about-us/how-  
we-work/our-board/board-meetings/board-meetings-2013/](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/#/about-us/how-we-work/our-board/board-meetings/board-meetings-2013/)
- 53 Food Standards Agency (2013): *Healthier choices made easier with new food labelling*  
[food.gov.uk/scotland/news-updates/news/2013/jun/scotlabel](http://food.gov.uk/scotland/news-updates/news/2013/jun/scotlabel)
- 54 Food Standards Agency (2012): *FS424019 Survey of diet among children in Scotland*  
[food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/  
ScotlandProjectList/fs424019/](http://food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs424019/)
- 55 Food Standards Agency (2008): *S14039: Secondary analysis of survey to measure intake of non-milk extrinsic sugar in Scottish children*  
[food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/  
ScotlandProjectList/s14039/](http://food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/s14039/)
- 56 Food Standards Agency (2008): *Survey of sugar intake among children in Scotland*  
[food.gov.uk/about-us/publications/scotpublications/](http://food.gov.uk/about-us/publications/scotpublications/)
- 57 Food Standards Agency (2012): *Development of a computerised web based 24 hour recall for use in dietary surveillance of Scottish children and young adults*  
[food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/  
ScotlandProjectList/fs244028/](http://food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs244028/)
- 58 Eatwell everyday (2013): *Homepage*  
[eatwelleveryday.org/](http://eatwelleveryday.org/)
- 59 Department of Health (2012): *National Diet and Nutrition Survey: Headline Results from Years 1, 2 and 3 (combined) of the Rolling Programme 2008/09 – 2010/11*  
[transparency.dh.gov.uk/2012/07/25/ndns-3-years-report/](http://transparency.dh.gov.uk/2012/07/25/ndns-3-years-report/)
- 60 Department of Health (2013): *Diet and Nutrition Survey of Infants and Young Children, 2011*  
[gov.uk/government/publications/diet-and-nutrition-survey-of-infants-and-young-  
children-2011](http://gov.uk/government/publications/diet-and-nutrition-survey-of-infants-and-young-children-2011)



- 61 The Scottish Government (2013): *Diet and Nutrition Survey of Infants and Young Children in Scotland, 2011*  
[scotland.gov.uk/Publications/2013/03/5846](http://scotland.gov.uk/Publications/2013/03/5846)
- 62 Department of Health (2012): *Report on dietary sodium intakes*  
[gov.uk/government/publications/assessment-of-dietary-sodium-levels-among-adults-aged-19-64-in-england-2011](http://gov.uk/government/publications/assessment-of-dietary-sodium-levels-among-adults-aged-19-64-in-england-2011)
- 63 Food Standards Agency (2010): *Agency publishes salt commitments*  
[food.gov.uk/news-updates/news/2010/mar/saltcommitments](http://food.gov.uk/news-updates/news/2010/mar/saltcommitments)
- 64 Food Standards Agency (2013): *Monitoring progress in Scotland against the FSA salt targets using market research data*  
[food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs306002/](http://food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs306002/)
- 65 Royal College of Physicians Working Party Report (2003): *Allergy the unmet need – a blueprint for better patient care*  
[www.bsaci.org/pdf/allergy\\_the\\_unmet\\_need.pdf](http://www.bsaci.org/pdf/allergy_the_unmet_need.pdf)
- 66 Food Standards Agency (2013): *Food allergen labelling*  
[food.gov.uk/policy-advice/allergyintol/label/](http://food.gov.uk/policy-advice/allergyintol/label/)
- 67 Food Standards Agency (2013): *T07 Programme review 2012*  
[food.gov.uk/science/research/allergy-research/more-allergy-research/allergy-program-review-2012](http://food.gov.uk/science/research/allergy-research/more-allergy-research/allergy-program-review-2012)
- 68 Food Standards Agency (2013): *Review of the food intolerance and food allergy research programme*  
[food.gov.uk/science/research/allergy-research/more-allergy-research/allergy-program-review-2012](http://food.gov.uk/science/research/allergy-research/more-allergy-research/allergy-program-review-2012)
- 69 Food Standards Agency (2012): *Report of the Heads of National Food Agencies Working Group on Transparent Use of Risk Assessment in Decision Making*  
[food.gov.uk/science/sci-gov/decision-making](http://food.gov.uk/science/sci-gov/decision-making)
- 70 Food Standards Agency (2011): *Minutes of Board meeting January 2011*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/)
- 71 Health and Safety Executive (2010): *Common sense common safety*  
[hse.gov.uk/aboutus/commonsense/index.htm](http://hse.gov.uk/aboutus/commonsense/index.htm)
- 72 Food Standards Agency (2012): *Review of international models for feed and food official controls*  
[food.gov.uk/science/research/choiceandstandardsresearch/ocr-research/fs616018/](http://food.gov.uk/science/research/choiceandstandardsresearch/ocr-research/fs616018/)
- 73 Food Standards Agency (2012): *Overview of delivery of official controls for food and feed safety*  
[food.gov.uk/science/research/choiceandstandardsresearch/ocr-research/fs616004/](http://food.gov.uk/science/research/choiceandstandardsresearch/ocr-research/fs616004/)
- 74 Food Standards Agency (2013): *Local Authority Enforcement Monitoring System*  
[food.gov.uk/enforcement/monitoring/laems/](http://food.gov.uk/enforcement/monitoring/laems/)

- 75 Food Standards Agency (2012): *Delivery of official controls for food and feed safety and standards by local authorities and port health authorities*  
[food.gov.uk/science/research/choiceandstandardsresearch/ocr-research/fs616021/](http://food.gov.uk/science/research/choiceandstandardsresearch/ocr-research/fs616021/)
- 76 Cranfield University (2013): *Centre for Environmental Risks and Futures (CERF)*  
[cranfield.ac.uk/sas/cerf/index.html](http://cranfield.ac.uk/sas/cerf/index.html)
- 77 Food Standards Agency (2013): *Board paper FSA 13/03/04*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/board-meetings-2013/130305/board-agenda-130305](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/board-meetings-2013/130305/board-agenda-130305)
- 78 Food Standards Agency (2011): *Future meat controls*  
[food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/](http://food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/)
- 79 Food Standards Agency (2013): *An evaluation of food chain information (FCI) and collection and communication of inspection results (CCIR) for all species*  
[food.gov.uk/science/research/foodborneillness/meathygieneresearch/m01prog/m01list/fs145002/](http://food.gov.uk/science/research/foodborneillness/meathygieneresearch/m01prog/m01list/fs145002/)
- 80 Food Standards Agency (2013): *A qualitative risk and benefit assessment for visual-only post-mortem meat inspection of cattle, sheep, goats and wild/farmed deer*  
[food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/fs245028/](http://food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/fs245028/)
- 81 Food Standards Agency (2013): *Trial of visual inspection of fattening pigs from non-controlled housing conditions*  
[food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/fs145003/](http://food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/fs145003/)
- 82 Food Standards Agency (2013): *Slaughterhouse social science project*  
[food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/fs145004/](http://food.gov.uk/science/research/choiceandstandardsresearch/meatcontrolsprojects/fs145004/)
- 83 European Food Safety Authority (2011): *Scientific opinion on public health hazards to be covered by inspection of meat (swine)*  
[efsa.europa.eu/en/efsajournal/pub/2351.htm](http://efsa.europa.eu/en/efsajournal/pub/2351.htm)
- 84 European Food Safety Authority (2012): *Poultry meat inspection; EFSA reviews risks for public health*  
[efsa.europa.eu/en/press/news/120629.htm](http://efsa.europa.eu/en/press/news/120629.htm)
- 85 European Food Safety Authority (2011): *EFSA completes first opinion in meat inspection work*  
[efsa.europa.eu/en/press/news/111003.htm](http://efsa.europa.eu/en/press/news/111003.htm)
- 86 European Commission (2013): *Rapid Alert System for Food and Feed*  
[ec.europa.eu/food/food/rapidalert/index\\_en.htm](http://ec.europa.eu/food/food/rapidalert/index_en.htm)
- 87 Food Standards Agency (2013): *UK Food Surveillance System*  
[food.gov.uk/enforcement/monitoring/fss/](http://food.gov.uk/enforcement/monitoring/fss/)

- 88 Food Safety Authority of Ireland (2013): *FSAI survey finds horse DNA in some beef burger products*  
[fsai.ie/news\\_centre/press\\_releases/horseDNA15012013.html](http://fsai.ie/news_centre/press_releases/horseDNA15012013.html)
- 89 Food Standards Agency (2013): *Findus beef lasagne products found with horse meat*  
[food.gov.uk/news-updates/news/2013/feb/findus](http://food.gov.uk/news-updates/news/2013/feb/findus)
- 90 Food Standards Agency (2013): *Horse meat investigation: industry test results*  
[food.gov.uk/enforcement/monitoring/horse-meat/horse-meat-test-results/](http://food.gov.uk/enforcement/monitoring/horse-meat/horse-meat-test-results/)
- 91 Food Standards Agency (2013): *Updated results of FSA's UK-wide survey of beef products*  
[food.gov.uk/news-updates/news/2013/mar/survey](http://food.gov.uk/news-updates/news/2013/mar/survey)
- 92 Food Standards Agency (2013): *More results of beef product testing published, June 2013*  
[food.gov.uk/enforcement/monitoring/horse-meat/](http://food.gov.uk/enforcement/monitoring/horse-meat/)
- 93 Food Standards Agency (2013): *Minutes of the open Board meeting April 2013*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/#/about-us/how-we-work/our-board/board-meetings/board-meetings-2013/](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/#/about-us/how-we-work/our-board/board-meetings/board-meetings-2013/)
- 94 Food Standards Agency (2012): *Research call: strategic challenge 2012*  
[food.gov.uk/news-updates/news/2012/jul/stratg2012](http://food.gov.uk/news-updates/news/2012/jul/stratg2012)
- 95 Food Standards Agency (2012): *Arsenic speciation in fruit and vegetables grown in the UK*  
[food.gov.uk/science/research/chemical-safety-research/env-cont/inorg-cont/fs241003/](http://food.gov.uk/science/research/chemical-safety-research/env-cont/inorg-cont/fs241003/)
- 96 Food Standards Agency (2013): *Management of food allergens: from threshold doses to analysis in foods*  
[food.gov.uk/science/research/allergy-research/allergy-thresholds/t07062/](http://food.gov.uk/science/research/allergy-research/allergy-thresholds/t07062/)
- 97 Food Standards Agency (2012): *Survey of diet among children in Scotland*  
[food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs424019/](http://food.gov.uk/science/research/devolvedadmins/scotlandresearch/scotlandresearch/ScotlandProjectList/fs424019/)
- 98 The Scottish Government (2011): *Preventing Overweight and Obesity in Scotland: A Route Map Towards Healthy Weight: Action Plan*  
[scotland.gov.uk/Publications/2011/03/17104457/1](http://scotland.gov.uk/Publications/2011/03/17104457/1)
- 99 Food Standards Agency (2011): *E. coli O157: control of cross-contamination*  
[food.gov.uk/news-updates/news/2011/feb/ecoli](http://food.gov.uk/news-updates/news/2011/feb/ecoli)
- 100 Food Standards Agency (2013): *'The Food and You' survey*  
[food.gov.uk/science/research/ssres/foodandyou/](http://food.gov.uk/science/research/ssres/foodandyou/)
- 101 Food Standards Agency (2013): *Biannual public attitudes tracker survey November 2012*  
[food.gov.uk/science/research/ssres/publictrackingsurveyNov2012](http://food.gov.uk/science/research/ssres/publictrackingsurveyNov2012)

- 102 Food Standards Agency (2013): *Exploring public responses to the labelling of GM food and the use of GM-free labelling*  
[food.gov.uk/science/research/ssres/crosscuts/fs242002/](http://food.gov.uk/science/research/ssres/crosscuts/fs242002/)
- 103 Food Standards Agency (2009): *Public attitudes to GM food*  
[food.gov.uk/science/research/ssres/foodsafetyss/gmfoodpublicattitudes](http://food.gov.uk/science/research/ssres/foodsafetyss/gmfoodpublicattitudes)
- 104 Food Standards Agency (2011): *Science and Evidence Strategy 2010 to 2015*  
[food.gov.uk/science/sci-gov/scistrat](http://food.gov.uk/science/sci-gov/scistrat)
- 105 Food Standards Agency (2013): *Forward evidence plan 2013*  
[food.gov.uk/news-updates/news/2013/jan/sci.evid2013](http://food.gov.uk/news-updates/news/2013/jan/sci.evid2013)
- 106 Food Standards Agency (2010): *UK research and innovation strategy for campylobacter in the food chain*  
[food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/](http://food.gov.uk/policy-advice/microbiology/campylobacterevidenceprogramme/)
- 107 Food Standards Agency (2010): *Economic and Social Research Council partnership*  
[food.gov.uk/science/research/ssres/esrc](http://food.gov.uk/science/research/ssres/esrc)
- 108 Food Standards Agency (2012): *BBSRC early career research fellowships*  
[food.gov.uk/news-updates/news/2012/jul/fellowships](http://food.gov.uk/news-updates/news/2012/jul/fellowships)
- 109 Food Standards Agency (2012): *Scholarship opportunity for veterinary graduates*  
[food.gov.uk/news-updates/news/2012/may/rvc-trainee](http://food.gov.uk/news-updates/news/2012/may/rvc-trainee)
- 110 Food Standards Agency (2013): *European research*  
[food.gov.uk/science/researchpolicy/europeanresearch/](http://food.gov.uk/science/researchpolicy/europeanresearch/)
- 111 European Commission (2013): *Research and Innovation – Horizon 2020*  
[ec.europa.eu/research/horizon2020/index\\_en.cfm](http://ec.europa.eu/research/horizon2020/index_en.cfm)
- 112 Food Standards Agency (2012): *Board paper 12/07/04*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/110712/boardagenda120711](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/110712/boardagenda120711)
- 113 Food Standards Agency (2012): *Framework for science governance*  
[food.gov.uk/science/sci-gov/](http://food.gov.uk/science/sci-gov/)
- 114 Food Standards Agency (2012): *A science checklist*  
[food.gov.uk/science/sci-gov/](http://food.gov.uk/science/sci-gov/)
- 115 Food Standards Agency (2012): *Incidents response protocol*  
[food.gov.uk/policy-advice/incidents/](http://food.gov.uk/policy-advice/incidents/)
- 116 Food Standards Agency (2012): *Framework for dialogue between the FSA and the SACs*  
[food.gov.uk/science/sci-gov/commswork/sac-dialogue](http://food.gov.uk/science/sci-gov/commswork/sac-dialogue)
- 117 European Food Safety Authority (2013): *EFSA promotes public access to data in transparency initiative*  
[efsa.europa.eu/en/press/news/130114.htm](http://efsa.europa.eu/en/press/news/130114.htm)

- 118 Food Standards Agency (2012): *Science and evidence: publication of underpinning data*  
[food.gov.uk/about-us/data-and-policies/underpinning-data](http://food.gov.uk/about-us/data-and-policies/underpinning-data)
- 119 Food Standards Agency (2013): *Evaluation of the Food Hygiene Rating Scheme and the Food Hygiene Information Scheme*  
[food.gov.uk/science/research/ssres/foodsafetyss/fs244011/](http://food.gov.uk/science/research/ssres/foodsafetyss/fs244011/)
- 120 Food Standards Agency (2013): *Royal assent for Wales hygiene ratings law*  
[food.gov.uk/news-updates/news/2013/mar/royal-assent-ratings](http://food.gov.uk/news-updates/news/2013/mar/royal-assent-ratings)
- 121 Food Standards Agency (2013): *Scientific committees*  
[food.gov.uk/science/ouradvisors/](http://food.gov.uk/science/ouradvisors/)
- 122 Food Standards Agency (2012): *Board paper INFO/12/07/01*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/110712/boardagenda120711](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/110712/boardagenda120711)
- 123 General Advisory Committee on Science (2012): *Quinquennial review of GACS 2012*  
[gacs.food.gov.uk/gacsreports/gacsreview2012](http://gacs.food.gov.uk/gacsreports/gacsreview2012)
- 124 Food Standards Agency (2012): *Board minutes July 2012*  
[food.gov.uk/about-us/how-we-work/our-board/board-meetings/#/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/](http://food.gov.uk/about-us/how-we-work/our-board/board-meetings/#/about-us/how-we-work/our-board/board-meetings/boardmeetings2012/)
- 125 Food Standards Agency (2013): *To evaluate the effectiveness of independently accredited assurance schemes and the role they could play in the delivery of official controls at UK entry points*  
[food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs204009/](http://food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs204009/)
- 126 Economic and Social Research Council (2013): *Global Food Systems and UK Food Imports: Resilience, Safety and Security*  
[esrc.ac.uk/impacts-and-findings/features-casestudies/features/25467/safe-food-in-a-global-system.aspx](http://esrc.ac.uk/impacts-and-findings/features-casestudies/features/25467/safe-food-in-a-global-system.aspx)
- 127 Global Food Security (2013): *Home page*  
[foodsecurity.ac.uk](http://foodsecurity.ac.uk)
- 128 Global Food Security (2013): *Global Food Security blog*  
[foodsecurity.ac.uk/blog/](http://foodsecurity.ac.uk/blog/)

## Annexe A – Agency science and evidence expenditure 2012/13

Contact for more information – [cst@foodstandards.gsi.gov.uk](mailto:cst@foodstandards.gsi.gov.uk)

Chemical Safety Programme					
Inorganic and process contaminants					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS102002</a>	An investigation by laser ablation and inductively coupled mass spectrometry of the graduation and levels of metal contaminants in UK grown fruits, vegetables and cereals – 2012 to 2013	01/10/2012	01/10/2013	University of Aberdeen	£65,806
<a href="#">FS102010</a>	Survey of cadmium in brown crabmeat and brown crabmeat products	06/07/2012	22/11/2012	CEFAS	£63,117
<a href="#">FS111001</a>	Nitrate in spinach and lettuce surveillance programme 2009 to 2013	01/01/2009	31/01/2014	ADAS UK Ltd	£17,639
<a href="#">FS231006</a>	3-MCPD esters (process contaminants in foods)	31/03/2010	31/03/2013	Premier Analytical Services	£28,043
<a href="#">FS231074</a>	3-MCPD esters (process contaminants in foods)	31/03/2010	31/03/2013	The Food and Environment Research Agency (FERA)	£29,206
<a href="#">FS231075</a>	3-MCPD esters (process contaminants in foods)	31/03/2010	31/03/2013	Institute of Chemical Technology	£31,410
<a href="#">FS235012</a>	The effects of preparation and processing on commonly detected permitted pesticide residues in some UK grown fruit, salads and vegetables	14/12/2011	13/12/2014	Agri-Food and Biosciences Institute	£84,592



Chemical Safety Programme					
Inorganic and process contaminants					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS241030</a>	Investigation of geochemical lead contamination of cattle, sheep, free range and organic chickens on UK farms	01/12/2011	30/11/2013	University of Bristol	£83,364
Inorganic and process contaminants total					£403,177
Organic contaminants					
<a href="#">FS102005</a>	Geographical investigation for contaminants in marine environment including fish and shellfish	11/02/2013	31/01/2015	The Food and Environment Research Agency (FERA)	£20,300
<a href="#">FS142001</a>	Acrylamide and furan survey – analysis of samples	10/11/2011	28/03/2014	Premier Analytical Services	£53,492
<a href="#">FS142001</a>	Acrylamide and furan survey – sampling	10/11/2011	28/03/2014	Ventress Technical Ltd	
<a href="#">FS231004</a>	Investigate the impact of agronomic practices on mycotoxin levels in oats and analysis of the implications of modifying agronomic practices	01/10/2008	31/05/2012	Harper Adams University College	£31,733
<a href="#">FS241004</a>	An investigation into the occurrence in food of chemicals used in pharmaceuticals, veterinary medicines and personal care products	01/01/2011	31/03/2013	The Food and Environment Research Agency (FERA)	£62,118
<a href="#">FS241029</a>	PROMETHEUS (Mitigation and elimination techniques for high food quality and their valuation using sensors and simulation)	01/05/2011	30/04/2014	The Food and Environment Research Agency (FERA)	£10,000
<a href="#">FS241031</a>	Preparation and analysis of Total Diet Study samples	01/01/2012	30/11/2012	The Food and Environment Research Agency (FERA)	£78,982
Organics contaminants total					£256,625



Chemical Safety Programme					
Risk assessment					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS121053</a>	EU Project – Total Diet Study exposure (TDS)	01/02/2012	31/01/2016	The Food and Environment Research Agency (FERA)	£17,080
<a href="#">FS231010</a>	Development of a food product with and without aspartame suitable for a double blind placebo controlled clinical trial	01/05/2009	31/08/2012	University of Hull	£204,000
<a href="#">FS231013</a>	Risk assessment of dietary dioxins	01/10/2008	31/03/2012	University of Nottingham	£5,535▼
<a href="#">FS231016</a>	Interpretation of margin of exposure for genotoxic carcinogens	01/01/2010	30/04/2012	Imperial College	£77,000
<a href="#">FS231017</a>	Genotoxic consequences of exposure to mixtures of food-derived chemical carcinogens	01/10/2009	31/05/2012	Imperial College	£50,799
<a href="#">FS231018</a>	A double blind placebo controlled parallel trial of soy phytoestrogens in patients with compensated hypogonadism	01/10/2009	05/11/2012	University of Hull	£27,300
<a href="#">FS231019</a>	Human <i>in vivo</i> and <i>in vitro</i> studies on gastrointestinal absorption of nanoparticles: the effect of size and surface properties	01/02/2010	13/08/2012	Health and Safety Laboratory	£61,388
<a href="#">FS231022</a>	ACROPOLIS (Aggregate and cumulative risk of pesticides: an online integrated strategy)	01/09/2010	30/06/2013	The Food and Environment Research Agency (FERA)	£45,812
<a href="#">FS231023</a>	Combined effects of aneugenic benzimidazoles and other aneugens which act by disrupting microtubli assembly	31/05/2010	31/05/2012	University of London – School of Pharmacy	£49,992
<a href="#">FS231025</a>	A study of the toxicokinetics of titanium dioxide nanoparticles using <i>in vitro</i> and <i>in vivo</i> models	01/02/2010	18/09/2012	The Food and Environment Research Agency (FERA)	£30,695

▼ Payment carried over from financial year 2011/12





Chemical Safety Programme					
Risk assessment					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS231027</a>	FACET (Flavourings, additives and food contact material exposure task)	01/09/2008	30/11/2012	The Food and Environment Research Agency (FERA)	£16,558
<a href="#">FS241062</a>	Brominated compounds: determination of levels of brominated chemicals in a human population (project extension)	30/04/2011	30/06/2013	University of Hull	£40,000
Risk assessment total					£626,159
Additives and food contact materials					
<a href="#">FS241001</a>	Development of a robust and fully validated method for the simultaneous determination of sweeteners (including neotame and steviol glycosides) in food	01/03/2011	31/07/2012	LGC Ltd	£18,458
<a href="#">FS241007</a>	Develop a post-market test for recycled food contact materials	01/03/2011	28/02/2013	Smithers Rapra Technology Ltd	£47,590
Additives and food contact materials total					£66,048
Novel and emerging technologies					
<a href="#">FS231071</a>	Nanoparticles in food: analytical methods for detection and characterisation	01/01/2010	31/05/2013	The Food and Environment Research Agency (FERA)	£3,955
<a href="#">FS242002</a> ▼	GM free labelling: exploring public responses to the labelling of GM food and the use of GM-free labelling	16/04/2012	29/10/2012	Define Research and Insight Ltd	£26,480
<a href="#">FS244027</a>	Validation of detection methods for GMOs	02/01/2013	01/12/2016	Nacionalni Institut Za Biologjijo	£103,327
Novel and emerging technologies total					£133,762



▼ Social science research project

Chemical Safety Programme					
Food allergy and intolerance					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS231062</a>	Characterisation of the immune mechanisms involved in the induction of oral tolerance to peanuts in children	01/07/2007	30/09/2014	Kings College London	£83,451
<a href="#">FS231063</a>	Randomized controlled trial of early introduction of allergenic foods to induce tolerance in infants (EAT study)	15/01/2008	31/03/2015	Kings College London	£213,056
<a href="#">FS231065</a>	Importance of skin exposure to allergens in the development of food allergy	15/07/2009	31/10/2013	University College Cork	£75,584
<a href="#">FS241037</a>	TRACE (The effect of extrinsic factors on food allergy)	30/04/2012	31/08/2016	Addenbrookes NHS Foundation Trust	£90,000
<a href="#">FS241038</a>	Survey of allergen advisory labelling and allergen content of UK retail pre-packed processed foods	31/05/2012	31/07/2013	Reading Scientific Services Ltd	£131,000
<a href="#">FS305004</a> ▼	Baseline study on the provision of allergy information to consumers for foods sold loose	22/10/2012	13/05/2013	Policy Studies Institute	£50,252
<a href="#">FS305005</a>	Systematic literature review of scientific published literature on infant feeding and development of atopic autoimmune disease	22/03/2013	31/07/2014	Imperial College	£12,517
<a href="#">FS305010</a>	Data analysis of UK PIFA birth cohort to understand the incidence and risk factors for food allergy in children aged 0 to 2 years	01/02/2013	31/10/2013	University of Southampton	£5,073
Food allergy and intolerance total					£660,933
Other chemical safety expenditure					
Radiological monitoring					£2,622,919
National Reference Laboratories (NRLs)					£321,576
Programme support*					£255,459
<b>Chemical Safety Programme total</b>					<b>£5,346,658</b>

▼ Social science research project

\* Programme support comprises: sample collection and storage, scientific research workshops, provision of expert external scientific advice, provision of scientific appraisals, knowledge transfer costs and administration and Scientific Advisory Committee secretariat and meeting costs.

## Cross-Cutting/Strategic Work Programme

Cross-cutting data sets					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS231078</a>	National Diet and Nutrition Survey (NDNS) rolling programme	01/04/2010	31/03/2013	Department of Health	£500,000
<a href="#">FS244007</a> ▼	Food and You survey 2012	12/09/2011	31/03/2013	TNS UK Ltd	£198,715
<a href="#">FS411003</a> ▼	Food and You survey wave 2, Scottish sample boost	12/09/2011	31/01/2013	TNS UK Ltd	£62,090
<a href="#">FS411004</a> ▼	Food and You survey, wave 2 Northern Ireland boost and healthy eating questions	12/03/2012	28/06/2013	TNS BMRB, Policy Studies Institute and University of Westminster	£101,024
<a href="#">FS526001</a>	Northern Ireland boost to the National Diet and Nutrition Survey (NDNS) rolling programme	01/09/2012	31/12/2018	Department of Health	£32,197
Cross-cutting data sets total					£894,026
Strategic evidence					
<a href="#">FS101029</a>	Assessing the potential of novel molecular epidemiological approaches for managing foodborne disease outbreaks	01/01/2012	30/06/2012	LGC Ltd	£18,000
<a href="#">FS102028</a>	Safety of sous-vide foods: Feasibility of extending ComBase to describe the growth/survival/death response of bacterial foodborne pathogens between 40° and 60°C	01/02/2012	31/05/2012	Institute of Food Research Enterprises	£17,582
<a href="#">FS203002</a>	Approaches to mitigate food safety concerns of supply chain for pumpkin and sesame seeds	30/04/2012	30/12/2012	University of Lincoln	£23,333
<a href="#">FS203003</a>	Detection of foreign contaminant objects in food using wideband radar	16/12/2011	14/12/2012	Integrated Surveillance Systems Ltd	£7,922
<a href="#">FS204012</a>	Development of the FoodRisk Alert database and piloting Food Fingerprinting	09/01/2012	08/07/2012	Queens University Belfast	£18,294
Strategic evidence total					£85,131



▼ Social science research project

Cross-Cutting/Strategic Work Programme					
Social science and analytical evidence					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS101020</a> ▼	Consumer willingness to pay for food safety health outcomes	14/01/2013	31/09/2013	GHK Consulting Ltd	£13,704
<a href="#">FS246001</a> ▼	Bi-annual public attitudes tracker	02/11/2010	18/05/2012	TNS UK Ltd	£1,740
Social science and analytical evidence total					£15,444
Futures, horizon scanning, emerging risks					
<a href="#">FS246007</a>	The Centre for Environmental Risk and Futures	01/04/2011	30/03/2014	Cranfield University	£50,000
Futures, horizon scanning, emerging risks total					£50,000
Other cross-cutting/strategic work expenditure					
FSA Post Graduate Scholarship Scheme**					£59,369
Skills, Capabilities and Partnerships					£45,077
Programme support*					£215,208
<b>Cross-Cutting/Strategic Work Programme total</b>					<b>£1,364,255</b>

Dietary Health and Nutrition Programme					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS244028</a>	Developing and testing an online 24-hr recall for children and young adults	01/04/2012	31/07/2013	University of Newcastle upon Tyne	£21,016
<a href="#">FS244029</a> ▼	Investigating how both consumer and health professionals understand healthy eating messages	23/08/2011	29/02/2012	Ipsos Mori	£1,018 ▼
<a href="#">FS306002</a>	Monitoring progress against FSA salt targets in Scotland for categories of food using market research data	14/09/2012	31/03/2013	TNS UK Ltd	£59,500
<a href="#">FS307001</a> ▼	Northern Ireland pilot in calorie information in catering businesses	01/08/2012	30/06/2013	University of Westminster	£51,688

▼ Payment carried over from financial year 2011/12

\* Programme support comprises: sample collection and storage, scientific research workshops, provision of expert external scientific advice, provision of scientific appraisals, knowledge transfer costs and administration and Scientific Advisory Committee secretariat and meeting costs.

▼ Social science research project

\*\* The FSA launched a postgraduate scholarship scheme (PGSS) in 2004 to help provide researchers with skills relevant to the FSA's future needs. 23 projects were funded through the scheme. The last call for applications closed on 31 March 2009 and currently there are no plans to issue a further call as the FSA is reviewing its needs for skills support and the best way to deliver these.

### Dietary Health and Nutrition Programme

Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS424015</a>	Analysis of vitamin D status in blood plasma samples from Scottish Health Survey in 2010 and 2011.	01/01/2010	31/12/2012	Scottish Government Analytical Services Division and Scottish Centre for Social Research	£2,000
<a href="#">FS411008</a> ▼	Technical recipe evaluation for the Northern Ireland pilot on calorie information in catering businesses	12/11/2012	31/12/2012	University of Ulster	£31,677
<a href="#">FS411010</a>	Development of 'Dish It Up' as a resource for early school leavers	30/11/2012	30/09/2013	Safefood	£20,000
<a href="#">FS424018</a>	Secondary analysis of Scottish dietary data contained in the living costs and food survey	16/11/2009	31/12/2014	The Robert Gordon University	£34,837
<a href="#">FS424019</a>	Survey of the diet of children in Scotland	05/01/2010	29/02/2012	University of Aberdeen	£11,323 ▼
<b>Other dietary health and nutrition expenditure</b>					
Programme support*					£6,896
<b>Dietary Health and Nutrition Programme total</b>					<b>£239,955</b>

### Effective Risk-Based Enforcement and Compliance Programme

#### Food hygiene delivery programme related evidence

Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS204009</a> ▼	To evaluate the effectiveness of independently accredited assurance schemes and the role they could play in the delivery of official controls at UK points of entry	18/12/2012	30/04/2013	GHK Consulting Ltd	£52,170
<a href="#">FS244011</a> ▼	Evaluation of the National Food Hygiene Rating Scheme for England, Wales and Northern Ireland and the Food Hygiene Information Scheme in Scotland	14/09/2011	30/06/2014	University of Westminster	£111,754

▼ Payment carried over from financial year 2011/12

\* Programme support comprises: sample collection and storage, scientific research workshops, provision of expert external scientific advice, provision of scientific appraisals, knowledge transfer costs and administration and Scientific Advisory Committee secretariat and meeting costs.

▼ Social science research project

Food Standards Agency

Effective Risk-Based Enforcement and Compliance Programme					
Food hygiene delivery programme related evidence					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS245004</a> ▼	Evaluation of interventions: Qualitative review of food safety regulatory decision-making	12/01/2011	31/01/2012	Ipsos Mori	£410▼
<a href="#">FS245013</a> ▼	Evaluating FSA guidance on cross contamination	01/02/2012	30/09/2012	University of Westminster	£70,731
<a href="#">FS245021</a> ▼	Segmentation of small and medium-sized food enterprises	01/01/2012	31/12/2012	Brook Lyndhurst	£98,431
<a href="#">FS410010</a> ▼	Food Hygiene Rating Scheme/ Food Hygiene Information Scheme – Campaign evaluation	19/12/2012	07/08/2013	Ipsos Mori	£150,772†
<a href="#">FS410013</a> ▼	Evaluation of the Food Hygiene Information Scheme	01/01/2013	08/07/2013	GfK NOP Ltd	£20,582
FS616002	Review of Delivery of Official Controls (RDOC) citizen and local authority professional forums	19/12/2007	30/06/2013	British Market Research Bureau	£105,489
<a href="#">FS616018</a>	International study of different existing delivery models for official controls	16/07/2012	31/07/2013	University of Birmingham	£47,261
Food hygiene delivery programme related evidence total					£657,600
Research to support official controls on shellfish and fish					
<a href="#">FS241054</a>	A survey of parasitic nematodes in maricultured finfish in Scotland	01/09/2011	30/04/2012	University of Stirling	£21,076
<a href="#">FS241055</a>	Review of the risk management practices employed throughout the fish processing chain in relation to controlling histamine formation in at-risk fish species in Scotland	01/09/2011	31/08/2012	Grimsby Institute for Higher Education	£27,202
<a href="#">FS241058</a>	Development and assessment of specific probes for detection and monitoring of toxin-producing phytoplankton species in Scottish waters	01/11/2011	31/01/2013	SAMS	£33,076
<a href="#">FS512006</a>	Critical review of the current evidence for the potential use of indicator shellfish species to classify UK shellfish production areas	18/01/2013	31/07/2013	CEFAS	£10,508

▼ Payment carried over from financial year 2011/12

▼ Social science research project

† Expenditure includes costs associated with running the campaign.

Effective Risk-Based Enforcement and Compliance Programme					
Research to support official controls on shellfish and fish					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS513005</a>	Research to support the development of a monitoring programme for new or emerging marine biotoxins in shellfish in UK waters	01/10/2012	31/05/2013	CEFAS	£65,595
Research to support official controls on shellfish and fish total					£157,457
Animal feed statutory enforcement					
<a href="#">FS616004</a>	Developing an overview of delivery of official controls for food and feed safety and standards by local authorities and port health authorities across the UK	30/04/2012	31/03/2013	AMTEC Consulting International Limited	£121,559
Animal feed statutory enforcement total					£121,559
Imported foods					
<a href="#">FS204010</a>	Potential for rapid onsite testing at border inspection posts	16/04/2012	30/12/2012	The Food and Environment Research Agency (FERA)	£25,597
<a href="#">FS204011</a>	Data mining tool to address safety of imported food including identification of emerging risks	01/04/2012	30/11/2012	LGC Ltd	£24,971
Imported foods total					£50,568

Effective Risk-Based Enforcement and Compliance Programme					
General enforcement and compliance					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS222001</a> ▼	Development of risk based sampling guidance for local authority enforcement officers	23/03/2012	19/01/2013	Greenstreet Berman Ltd	£12,476
<a href="#">FS245020</a> ▼	A tool to diagnose culture in food business operators	10/01/2012	30/03/2012	Greenstreet Berman Ltd	£500 ▼
<a href="#">FS616021</a>	In-depth exploration of official controls for food and feed safety and standards by local authorities and port health authorities	01/09/2012	30/04/2013	Quo Vadis Consulting Partners Ltd	£186,384
General enforcement and compliance total					£199,360
Other effective risk-based enforcement and compliance expenditure					
Dairy hygiene controls					£898,391
Shellfish and marine biotoxin monitoring and surveillance					£3,757,226
Other official controls					£4,315,891
National Reference Laboratories (NRLs)					£308,329
Programme support*					£143,441
<b>Effective Risk-Based Enforcement and Compliance Programme total</b>					<b>£10,609,822</b>

Hygiene and Microbiology Programme					
Campylobacter					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS101025</a>	Project to assess the impact of freezing on campylobacter in chicken livers	01/11/2012	31/03/2013	University of Bristol	£9,974
<a href="#">FS101042</a>	Sources, seasonality, transmission and control: campylobacter and human behaviour in a changing environment	08/05/2012	08/05/2017	MRC	£70,000

▼ Payment carried over from financial year 2011/12

\* Programme support comprises: sample collection and storage, scientific research workshops, provision of expert external scientific advice, provision of scientific appraisals, knowledge transfer costs and administration and Scientific Advisory Committee secretariat and meeting costs.

▼ Social science research project



## Hygiene and Microbiology Programme

### Campylobacter

Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS121014A</a>	Efficacy, practicality, and costs of using currently available intervention methods to reduce campylobacter contamination in slaughterhouses	01/02/2011	31/12/2013	Campden BRI	£209,289
<a href="#">FS121014B</a>	Efficacy, practicality, and costs of using lactic acid solutions, ozonated water, or ozonated carbon dioxide pellets to reduce campylobacter contamination in slaughterhouses	01/02/2011	31/03/2013	Campden BRI	
<a href="#">FS121014C</a>	Maintaining sentinel surveillance for human campylobacteriosis in Oxfordshire: monitoring the impact of poultry industry interventions on the burden of human disease	01/07/2011	30/06/2014	DEFRA	
<a href="#">FS231081</a>	Production systems, bird welfare and endemic disease affect the susceptibility of chickens to campylobacter	01/11/2011	30/04/2014	BBSRC	£396,205
<a href="#">FS231082</a>	Campylobacter phase variation and its impact on immunity and vaccine development	05/03/2012	04/03/2015		
<a href="#">FS231083</a>	Interventions effects on campylobacter populations in poultry and poultry meat	01/02/2012	31/01/2015		
<a href="#">FS231084</a>	Integrating microbiology and modelling to determine the source of campylobacter infection in the broiler house and develop interventions	01/02/2012	31/01/2014		
<a href="#">FS231085</a>	Dynamics of susceptibility and transmission of <i>Campylobacter jejuni</i> in chickens	01/10/2012	30/09/2014		
<a href="#">FS231086</a>	Modelling campylobacter survival and spread through poultry processing: a population genomics approach	05/03/2012	04/03/2014		

Hygiene and Microbiology Programme					
Campylobacter					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS241040</a>	Development of accurate predictive models for the assessment of the survival of <i>Campylobacter jejuni</i> and <i>Campylobacter coli</i> under food-relevant conditions	01/04/2011	30/04/2014	University of Liverpool	£169,411
<a href="#">FS241044</a>	A microbiological survey of campylobacter contamination in fresh whole UK produced chilled chickens at retail sale	01/01/2012	31/03/2013	Health Protection Agency	£63,066
<a href="#">FS241049A</a>	A study to provide information on the feasibility of development of a rapid on site test for campylobacter in poultry production	01/03/2011	31/03/2013	Agri-Food and Biosciences Institute	£101,309
<a href="#">FS241049B</a>	A study to provide information on the feasibility of development of a rapid on site test for campylobacter in poultry production	01/03/2011	31/12/2012	Moredun Scientific Ltd	
<a href="#">FS241051A</a>	Monitoring campylobacter in broiler slaughterhouses	01/01/2011	31/03/2013	Hutchison Scientific Ltd	£329,803
<a href="#">FS241051B</a>	Monitoring programme for campylobacter in broiler flocks and broiler carcasses in the UK	01/11/2011	30/09/2015	Animal Health and Veterinary Laboratories Agency	
<a href="#">FS241052</a>	A quantitative assessment of consumers' understanding of campylobacter and attitudes towards poultry decontamination treatments	01/12/2011	31/08/2012	GfK NOP Ltd	£76,603
<a href="#">FS241063</a>	Investigation into changes of campylobacter numbers on broiler carcasses during and following processing	01/02/2011	31/03/2013	University of Bristol	£153,593
<a href="#">FS421003</a>	Employing source attribution and molecular epidemiology to measure the impact of interventions on human campylobacteriosis in Scotland	01/11/2010	31/01/2016	University of Aberdeen	£115,674
Campylobacter total					£1,694,927

Hygiene and Microbiology Programme					
Listeria					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS241042</a>	UK-wide microbiological survey of <i>Listeria monocytogenes</i> in pre-packed ready-to-eat sliced meats in small-to-medium enterprises	01/04/2012	31/03/2013	Agri-Food and Biosciences Institute	£205,701
<a href="#">FS241045</a>	A comprehensive review of current practices in the management of <i>Listeria monocytogenes</i> utilised by the cooked sliced meat sector	01/01/2013	31/01/2014	Hutchison Scientific Ltd	£13,341
<a href="#">FS425012</a>	Review of current practices in the management of <i>Listeria monocytogenes</i> in smoked fish production in Scotland and Northern England	07/03/2011	01/01/2012	Hutchison Scientific Ltd	£1,500▼
Listeria total					£220,542
Viruses					
<a href="#">FS101036</a>	A critical review of methods for distinguishing infectious and non-infectious norovirus	23/01/2012	31/03/2012	Leatherhead Food Research	£300▼
<a href="#">FS241043</a>	A systematic review of the survival of norovirus in foods and on food contact surfaces	01/11/2012	31/05/2013	Leatherhead Food Research	£25,243
Viruses total					£25,543
Verocytotoxin-producing <i>Escherichia coli</i>					
<a href="#">FS102029</a>	Whole genome molecular epidemiology of <i>E. coli</i> O157 isolates from humans, food and the environment	03/09/2012	30/09/2013	University of Aberdeen	£8,800
<a href="#">FS421008</a>	The effect of feeding brassicas to ruminants on <i>E. coli</i> O157 shedding	01/10/2009	30/09/2012	University of Aberdeen	£2,500
<a href="#">FS421009</a>	Feasibility of introducing methods in the UK for reducing <i>E. coli</i> O157 infection in cattle prior to slaughter	14/02/2011	31/03/2012	Scottish Agricultural College	£600▼
Verocytotoxin-producing <i>Escherichia coli</i> total					£11,900



▼ Payment carried over from financial year 2011/12

Hygiene and Microbiology Programme					
Other pathogens					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS101016</a>	Q fever risk to human health from the consumption of contaminated unpasteurised milk and milk products	02/01/2013	31/07/2013	Animal Health and Veterinary Laboratories Agency	£30,999
Other pathogens total					£30,999
Future meat controls					
<a href="#">FS145002</a>	An evaluation of Food Chain Information (FCI) and Collection and Communication of Inspection Results (CCIR) for all species	01/09/2011	31/01/2013	MLCSL Consulting	£13,120
<a href="#">FS145003</a>	Trial of visual inspection of fattening pigs from non-controlled housing conditions	01/11/2011	31/01/2013	Scottish Agricultural College	£73,741
<a href="#">FS145004</a> ▼	Slaughterhouse social science research project	23/01/2012	31/01/2013	Ipsos Mori	£126,000
<a href="#">FS245025</a>	Feasibility study into the use of plant inspection assistants in approved game handling establishments	01/04/2012	30/09/2013	SFQC Ltd	£96,298
<a href="#">FS245028</a>	A qualitative risk and benefit assessment for visual-only post-mortem meat inspection of cattle, sheep, goats and farmed/wild deer	15/10/2011	31/01/2013	Animal Health and Veterinary Laboratories Agency	£44,321
Future meat controls total					£353,480
Transmissible Spongiform Encephalopathy (TSE) policy					
<a href="#">FS231046</a>	Risk of transmission of atypical forms of animal TSE to humans	01/04/2007	31/12/2012	University of Edinburgh	£131,049
<a href="#">FS231049</a>	The tissue distribution disease-related PrP and infectivity for atypical scrapie in sheep following experimental oral challenge	01/05/2007	31/12/2012	University of Edinburgh	£104,310
<a href="#">FS231051</a>	Exploring permeability of human species barrier to circulating TSE agent	01/03/2007	28/02/2013	École nationale vétérinaire de Toulouse	£106,128
Transmissible Spongiform Encephalopathy (TSE) policy total					£341,487

▼ Social science research project

Hygiene and Microbiology Programme					
Food hygiene policy					
Project code	Project title	Start date	End date	Organisation	Expenditure 2012/13 financial year
<a href="#">FS231058</a>	Trichinella in UK wildlife	01/04/2009	31/05/2013	The Food and Environment Research Agency (FERA)	£112,957
<a href="#">FS244026</a> ▼	Domestic kitchens and food safety: exploring practices-technology and design	15/11/2011	30/05/2013	University of Hertfordshire	£51,705
<a href="#">FS245027</a>	Microbiological risks from the production and consumption of uneviscerated small game birds compared to eviscerated small game birds	01/04/2012	31/03/2013	Animal Health and Veterinary Laboratory Agency	£36,974
<a href="#">FS241023</a>	Development of a screening protocol for the detection of extended-spectrum beta-lactamase producing Enterobacteriaceae in food	03/05/2010	31/10/2013	Animal Health and Veterinary Laboratory Agency	£74,743
Food hygiene policy total					£276,379
Other hygiene and microbiology expenditure					
National Reference Laboratories (NRLs)					£178,055
Programme support*					£13,332
<b>Hygiene and Microbiology Programme total</b>					<b>£3,146,644</b>



\* Programme support comprises: sample collection and storage, scientific research workshops, provision of expert external scientific advice, provision of scientific appraisals, knowledge transfer costs and administration and Scientific Advisory Committee secretariat and meeting costs.

▼ Social science research project

<b>Summary Table</b>	
<b>Programme</b>	<b>Expenditure 2012/13 financial year</b>
Chemical Safety	£5,346,658
Cross-Cutting/Strategic Work	£1,364,255
Dietary Health and Nutrition	£239,955
Effective Risk-Based Enforcement and Compliance	£10,609,822
Hygiene and Microbiology	£3,146,644
<b>Total science and evidence gathering spend 2012/13</b>	<b>£20,707,334</b>

## Annexe B – Tables of co-funded projects

Projects include those funded by us and one or more other organisations, and/or projects where the data or resources are from previous research.

**Table 1**  
**Co-funded projects in the EU framework programme 7**

Project code	Title	Full Title	Start date	End date
<a href="#">FS121053</a>	TDS	Total Diet Study exposure	01/02/2012	31/01/2016
<a href="#">FS204012</a>	Invest Northern Ireland and European Commission FP7 Project QSAFFE	Development of the FoodRisk Alert database and piloting Food Fingerprinting	09/01/2012	08/07/2012
<a href="#">FS231022</a>	ACROPOLIS	Aggregate and cumulative risk of pesticides	01/09/2010	30/06/2013
<a href="#">FS231027</a>	FACET	Flavourings, additives and food contact material exposure task	01/09/2008	30/11/2012
<a href="#">FS231071</a>	NANOLYSE	Nanoparticles in food: Analytical methods for detection and characterisation	01/01/2010	31/05/2013
<a href="#">FS241029</a>	PROMETHEUS	Process contaminants: mitigation and elimination techniques for high food quality and their evaluation using sensors and simulation	01/05/2011	30/04/2014

Table 2 Other co-funded science and evidence-gathering work				
Project code	Co-funder(s)	Full Title	Start Date	End Date
<a href="#">FS101042</a>	MRC	Sources, seasonality, transmission and control: campylobacter and human behaviour in a changing environment	08/05/2012	08/05/2017
<a href="#">FS121014C</a>	Defra	Maintaining sentinel surveillance for human campylobacteriosis in Oxfordshire: monitoring the impact of poultry industry interventions on the burden of human disease	01/07/2011	30/06/2014
<a href="#">FS131006</a>	EA, SEPA, NIEA	Radioactivity In Food and the Environment (RIFE) report	01/04/2007	31/12/2013
<a href="#">FS131007</a>	CEFAS	Marine assessment and advice	01/04/2007	31/03/2013
<a href="#">FS131008</a>	EA, HSE	Radiological assessments by 'habits' survey	01/04/2007	30/08/2013
<a href="#">FS231013</a> ▼ (extension)	FERA	Risk assessment of dietary dioxins	01/10/2008	31/03/2012
<a href="#">FS231062</a>	US NIH	Characterisation of the immune mechanisms involved in the induction of oral tolerance to peanuts in children	01/07/2007	30/09/2014
<a href="#">FS231063</a>	MRC, St Thomas' Hospital and St George's Hospital Trust	Randomized controlled trial of early introduction of allergenic foods to induce tolerance in infants	15/01/2008	31/03/2015
<a href="#">FS231065</a>	SCOPE study, Baseline Study, Funders	Investigation of the association of skin barrier structure and function and the development of food allergy. A prospective birth cohort study	15/07/2009	31/10/2013
<a href="#">FS231078</a>	DH, Safefood, DHSSPS	National Diet and Nutrition Survey (NDNS) rolling programme	01/04/2010	31/03/2013
<a href="#">FS231081</a>	BBSRC	Production systems, bird welfare and endemic disease affect the susceptibility of chickens to campylobacter	01/11/2011	30/04/2014
<a href="#">FS231082</a>	BBSRC	Campylobacter phase variation and its impact on immunity and vaccine development	05/03/2012	04/03/2015
<a href="#">FS231083</a>	BBSRC	Interventions effects on campylobacter populations in poultry and poultry meat	01/02/2012	31/01/2015
<a href="#">FS231084</a>	BBSRC	Integrating microbiology and modelling to determine the source of campylobacter infection in the broiler house and develop interventions	01/02/2012	31/01/2014
<a href="#">FS231085</a>	BBSRC	Dynamics of susceptibility and transmission of <i>Campylobacter jejuni</i> in chickens	01/10/2012	30/09/2014

▼ Payment carried over from financial year 2011/12





**Table 2**  
**Other co-funded science and evidence-gathering work**

Project code	Co-funder(s)	Full Title	Start Date	End Date
<a href="#">FS231086</a>	BBSRC	Modelling campylobacter survival and spread through poultry processing: a population genomics approach	05/03/2012	04/03/2014
<a href="#">FS421008</a>	University of Aberdeen, QMS and NFUS	The effect of feeding brassicas to ruminants on <i>E. coli</i> O157 shedding	01/10/2009	30/09/2012
<a href="#">FS424015</a>	Scottish Government	Analysis of vitamin D status in blood plasma samples from Scottish health survey in 2010 and 2011	01/01/2010	31/12/2012
<a href="#">FS424018</a>	Scottish Government	Secondary analysis of Scottish dietary data contained in the living costs and food survey	16/11/2009	31/12/2014
<a href="#">FS424019</a> ▼	Scottish Government	Survey of the diet of children in Scotland	05/01/2010	29/02/2012

▼ Payment carried over from financial year 2011/12

## Glossary of co-funders

BBSRC	Biotechnology and Biological Sciences Research Council
CEFAS	Centre for Environment, Fisheries & Aquaculture Science
Defra	Department for Environment, Food and Rural Affairs
DH	Department of Health
DHSSPS	Department of Health, Social Services and Public Safety, Northern Ireland
EA	Environment Agency
FERA	Food and Environment Research Agency
HSE	Health and Safety Executive
ITN	Immune Tolerance Network (USA)
MRC	Medical Research Council
NFUS	National Farmers Union, Scotland
NHS	National Health Service
NIEA	Northern Ireland Environment Agency
OGD	Other government departments
QMS	Quality Meat Scotland
SEPA	Scottish Environment Protection Agency
US NIH	United States National Institutes of Health



## Annexe C – Universal ethical code for scientists

Rigour, respect and responsibility: A universal ethical code for scientists

### **Rigour, honesty and integrity**

- Act with skill and care in all scientific work. Maintain up to date skills and assist their development in others.
- Take steps to prevent corrupt practices and professional misconduct. Declare conflicts of interest.
- Be alert to the ways in which research derives from and affects the work of other people, and respect the rights and reputations of others.

### **Respect for life, the law and the public good**

- Ensure that your work is lawful and justified.
- Minimise and justify any adverse effect your work may have on people, animals and the natural environment.

### **Responsible communication: listening and informing**

- Seek to discuss the issues that science raises for society. Listen to the aspirations and concerns of others.
- Do not knowingly mislead, or allow others to be misled, about scientific matters. Present and review scientific evidence, theory or interpretation honestly and accurately.






For more information on the Code, see:

[www.bis.gov.uk/cst/cst-reports/reports-1999-2010#Ethics](http://www.bis.gov.uk/cst/cst-reports/reports-1999-2010#Ethics)



For further information and advice about food, or to download this publication, visit the Food Standards Agency's website:  
[food.gov.uk](http://food.gov.uk)

#### Connect with us

- |   |  |
|---|--|
|  Like us on Facebook   | <a href="http://food.gov.uk/facebook">food.gov.uk/facebook</a> |
|  Join our conversation | <a href="http://food.gov.uk/twitter">food.gov.uk/twitter</a>   |
|  Watch us on YouTube   | <a href="http://food.gov.uk/youtube">food.gov.uk/youtube</a>   |
|  Get our news by RSS   | <a href="http://food.gov.uk/rss">food.gov.uk/rss</a>           |
|  Get our news by email | <a href="http://food.gov.uk/email">food.gov.uk/email</a>       |

Scan our QR vCard to easily store our contact details in your smart phone



© Crown Copyright 2013

The content of this publication is subject to Crown copyright protection unless otherwise indicated.

You may re-use the information in this publication (not including the Food Standards Agency logos and photographs that are the copyright of a third party) free of charge in any format or medium, under the terms of the Open Government Licence at: [nationalarchives.gov.uk/doc/open-government-licence/](http://nationalarchives.gov.uk/doc/open-government-licence/) Any enquiries regarding the use and re-use of this information resource should be emailed to: [psi@nationalarchives.gsi.gov.uk](mailto:psi@nationalarchives.gsi.gov.uk)

Published by the Food Standards Agency September 2013  
Printed in England [FSA/1707/0913]



When you have finished with this publication please recycle it