SCIENCE IN THE FSA: ANNUAL REPORT OF THE CHIEF SCIENTIST 2011/12

Report by Andrew Wadge, Chief Scientist

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1 SUMMARY

1.1 The Chief Scientist will present his Annual Report of the Chief Scientist to the Board (Annexe 1), together with outline plans for the launch event.

1.2 The Board is asked to:

- consider and endorse the Report
- note the plans to publish it in the autumn

2 INTRODUCTION

2.1 This is the sixth Annual Report of the Chief Scientist and covers the period April 2011 to March 2012.

3 DISCUSSION

3.1 The Report highlights the following areas of the FSA’s science:

- Tracking foodborne disease. This section considers trends in foodborne disease and it provides an update on the FSA’s work on the five key pathogens monitored by the Agency: campylobacter, the most common cause of food poisoning; listeria, which is associated with the highest mortality rate; salmonella, E. coli O157 and norovirus.

- There is an update on chemical safety including trends in food intolerance and food allergy.

- The evidence gathering work conducted by the FSA in Scotland and Northern Ireland to measure progress towards dietary targets and to inform policy developments.

- There is an update on scientific activities during the financial year 2011/12 to support: the development of the FSA’s policies on modernising meat controls and food hygiene delivery; on evaluating policy on food hygiene standards; and lifting radiation monitoring controls post-Chernobyl.
There is an update on individual research projects and surveys published in the financial year 2011/12, with highlights from each of the high level programmes in the science and evidence portfolio: hygiene and microbiology; chemical safety; dietary health and nutrition, effective risk based enforcement and compliance and cross cutting/strategic.

3.2 There will be a launch event at a London venue on the 27 September 2012, at which Professor Sarah O’Brien, Chair of the Advisory Committee on the Microbiological Safety of Food, will present a keynote speech on ‘Molecular Epidemiological Approaches for Managing Foodborne Disease’.

3.3 In response to requests for hard copies of the Report, a limited number of copies (maximum 500) will be printed this year for key stakeholders.

3.4 In line with measures to minimise costs and environmental impact the Report will also be published and promoted electronically. The online report will include links to the extensive information on the FSA’s website, to enable readers to find out about issues in more detail.

4 CONCLUSION AND RECOMMENDATIONS

4.1 The Board is asked to:

- **consider** and **endorse** the Report
- **note** the plans to publish it in the autumn
Science in the FSA

DRAFT ANNUAL REPORT OF THE CHIEF SCIENTIST 2011/12
# 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.
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Annexe A [Drafting note: Table will be available prior to publication]
Annexe B [Drafting note: Table will be available prior to publication]
Welcome to my sixth Annual Report, covering the period from 1 April 2011 to 31 March 2012.

[Drafting note: The Chief Scientist will draft the introduction prior to the publication date]
Chapter 1: Foodborne disease

Foodborne illness in the UK

Food safety is our top priority and the reduction of foodborne disease is a key objective to help protect consumers.

Contamination of foods with microorganisms or their toxins can occur via a variety of means and at different points in the food chain for example:

- production of raw foods such as meat, eggs, fish and shellfish, fruits and vegetables pre or post harvest or during processing
- the improper handling, storing, transporting or preparation of foodstuffs
- cross contamination from raw to ready-to-eat foods in the kitchen

In May 2011 we published a refreshed Foodborne Disease Strategy for 2010 to 2015. The strategy describes the proposed approach of focusing on the control of the key foodborne pathogens that have been identified for priority action. Food chain analysis showed that the pathogens whose reduction and control offer the greatest potential for public health gains are:

- campylobacter, which causes most cases of food poisoning
- *Listeria monocytogenes* (*L. monocytogenes*), which leads to the most food poisoning deaths
- viruses, responsible for an increasing number of cases

The strategy is based on a farm-to-fork approach, with the aim of reducing contamination of foods during production and processing, and of promoting good food hygiene practice in the kitchen, both commercially and in the home. Other important pathogens, such as *E. coli* O157 and salmonella are being addressed through other streams of work.

1.1 Burden of foodborne disease

There are significant challenges in assessing and monitoring the burden of foodborne disease and further work is currently underway to refine these estimates. We face a particular challenge in that the number of laboratory-confirmed cases of infection with key foodborne pathogens is lower than the actual number of these infections because affected individuals often fail to report the illness to their general
practitioner. To take account of this, 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. Currently these estimates are based on the first study of Infectious Intestinal Disease (IID study) carried out in the mid-1990s which only covered England and Wales, therefore its applicability for Scotland and Northern Ireland is uncertain. The second study of Infectious Intestinal Disease in the community (IID2 study)\(^3\) covered disease across the whole of the UK, and further research due to report later this year has been funded utilising the results of the IID2 study and other data sources, to estimate the burden of foodborne disease. In future this should enable us to produce better estimates for the whole of the UK. Further details of the IID2 study are available in Chapter 4.

Our 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 500 deaths. Campylobacter and norovirus are considered the most common cause of cases of foodborne illness among the five main pathogens we monitor (campylobacter, \textit{L. monocytogenes}, norovirus, \textit{E. coli} O157 and salmonella), although the pattern is different with respect to hospital admissions and deaths, see Figure 1 below.

![Figure 1: Relative proportion of burden in terms of cases, hospital admissions and deaths for five key pathogens in England and Wales, 2010\(^a\)](image)

Of the five main pathogens, campylobacter causes most of the cases (52%) of foodborne illness in England and Wales, and the highest proportion of hospitalisation

\(^a\) 1) It is uncertain what proportion of norovirus cases can be attributed to food as there are still significant gaps in scientific knowledge. 2) There were an estimated 313 \textit{L. monocytogenes} cases which represents less than 0.04% of cases. 3) At the time of writing 2011 figures were not available.
(90%), although *L. monocytogenes* accounts for the highest proportion (32%) of deaths, see Figure 1 (previous page). Together these two bacterial foodborne pathogens impose the greatest disease burden and thus their control could offer the greatest public health benefits.

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. In 2010, the estimated cost was £1.5 billion. Using the ascertainment rates in England and Wales we estimate the cost for all of the UK including Scotland and Northern Ireland to be about £1.9 billion. Table 1 below, provides a breakdown of how the estimated annual costs arose for England and Wales.

<table>
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<th>Year</th>
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<th>Pain &amp; suffering</th>
<th>Total Cost</th>
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<td>2010</td>
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</table>

Table 1: Estimated economic burden from foodborne pathogens in England and Wales

### 1.2 Trends, issues and actions

We monitor foodborne disease over time using the number of reported laboratory-confirmed cases and reported cases of illness caused by pathogenic organisms that are commonly associated with food poisoning. We have monitored trends for *campylobacter, L. monocytogenes, E. coli* O157 and salmonella since 2000.

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b 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 2010 quarter 1 prices, to allow for comparison to be made between years.

3) The reliability of such estimates will be reviewed in 2012-13 following the publication of the IID2 extension.
Between 2000 and 2004 there was a significant decline in the combined number of confirmed cases of these four pathogens. However, more recently, the number of UK acquired cases has increased. In last year’s report we included norovirus trend data, because it is a significant cause of infectious intestinal disease. However, we only have reliable data for this pathogen going back to 2005. Provisional data indicate that in 2011, in the UK, there were approximately 94,000 laboratory-confirmed cases of the five key foodborne pathogens we now monitor.

The following charts in this report are intended to bring the reported figures in line with those published by the surveillance bodies and are therefore not directly comparable to those in our previous Chief Scientist Annual Reports. This year we are reporting all laboratory-confirmed cases, whereas in previous years we have reported laboratory-confirmed cases thought to have been acquired in the UK and not associated with foreign travel. However, the number of cases acquired abroad is known to be poorly recorded and accuracy varies between pathogens.

Figure 2 below, represents the percentage change of the UK confirmed laboratory reports for four of the key pathogens monitored since 2000, compared to the baseline figure (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 L. monocytogenes compared to 2000 figures](image-url)
It should be noted that due to the small number of laboratory-reported cases of listeriosis, the percentage change from baseline can be affected significantly by a relatively minor change in reports.

Norovirus was excluded from the key pathogens in Figure 2 as data from 2000 to 2004 is considered less reliable. We started to monitor UK laboratory-confirmed cases of norovirus in 2005. Data for 2011 indicates an increase in confirmed cases of about 130% from the 2005 baseline. However, much of this increase was due to improvements in surveillance systems for norovirus, better diagnostic methods, and increasing uptake of these methods by laboratories. In addition, 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.

Individual UK trends, issues and actions for each of the key pathogens are considered in more detail below. It should be noted that data for 2011 are provisional.

**Campylobacter**

Campylobacter continues to be the most commonly reported bacterial cause of infectious intestinal disease in the UK and is the leading cause of bacterial food poisoning. The majority of campylobacter infections are caused by *Campylobacter jejuni* (approximately 93%) with the remainder caused by *Campylobacter coli* and other, minor species. Campylobacteriosis is characterised by severe diarrhoea and abdominal pain. There are many risk factors for campylobacter, but research has shown that between 60 and 80% of clinical infections may be attributed to chicken. The majority of cases are sporadic (i.e. isolated) and whilst historically outbreaks were regarded as rare they have increased in recent years (a detailed description of what constitutes a foodborne outbreak is provided in Section 1.3).

There was a decrease in the number of laboratory-confirmed cases of campylobacter in the UK between 2000 and 2004; however, there has been an increasing trend in the UK since then. There were 71,944 laboratory-confirmed cases of campylobacter in 2011 compared with 70,323 in 2010, see Figure 3 over the page.

In the main it remains unclear whether the upward trend in campylobacter cases since 2004 has been due to an increase in infection, increased reporting, or a combination of these two factors. In 2012 we issued a research call for the enhanced molecular surveillance of campylobacter.4
We committed to develop and implement a risk management programme to reduce campylobacter in chicken as part of our Foodborne Disease Strategy. The Joint Government/Industry Working Group on Campylobacter agreed a target to reduce the percentage of chickens produced in UK poultry slaughterhouses with the highest levels of campylobacter contamination from 27% (the baseline in 2008) to 10% by 2015. If successful it is estimated that we could see a reduction in campylobacter food poisoning of up to 30%, equivalent to about 111,000 cases per year.

In 2010 we put out two joint calls, one with the Department for Environment, Food and Rural Affairs (Defra), the other with the Biotechnology and Biological Sciences Research Council (BBSRC) and Defra for research to reduce the levels of campylobacter in the food chain and ultimately the incidence of campylobacter infection in humans. By working with partners we are able to share resources to develop a high quality evidence base in a more coherent way.

As part of a new Campylobacter Research Programme, we have devoted nearly £3 million of funding towards research aimed at reducing campylobacter food poisoning over the past year. The programme encompasses a variety of projects targeted at different points across the food chain, from farm to fork.

In January 2012 a joint funders campylobacter workshop was held to communicate and discuss the research work we had recently commissioned, see text box over the page.

Figure 3: Laboratory-confirmed cases of campylobacter in the UK, reported between 2000 and 2011
Joint funders campylobacter workshop

Fifteen projects within the Campylobacter Research Programme, many of which had begun in the past year, were discussed with the joint working group, industry collaborators and funders. The workshop provided researchers with the opportunity to discuss progress of their research and trials, and to announce preliminary findings. It also enabled project plans to be explored. The research commissioned covers a range of projects targeted at different points across the food chain, from farm to fork:

Farm controls

- Assessment of current practice and the benefits of training.
- Study of on-farm biosecurity and specific interventions, to determine if scientifically robust evidence of the efficacy of specified biosecurity procedures and interventions can be produced in reducing the prevalence of campylobacter in flock.
- Consideration of the effects of increased dietary polyunsaturated fatty acids in the diet of broiler chickens to reduce campylobacter levels.

On farm testing

- Assessment of the feasibility of rapid on-farm testing for campylobacter, including a detailed literature review on potential methods and working in consultation with interested parties to consider scenarios for use and the desired qualities of the test.
- Development of a rapid on-farm test for campylobacter which considers on-farm sampling methodologies and matrices, available rapid method technologies, transport and traditional culture protocols.
- Development of a novel rapid on-farm lateral flow test for campylobacter in poultry.

Consumer social science

- An initial literature review, which indicated there is limited published information on consumer acceptability of decontamination treatments of beef or poultry, has been followed by discussions with interested parties, to develop a questionnaire to consider consumer understanding of campylobacter and attitudes towards raw meat decontamination treatments.
- An investigation of in-home food behaviours, to consider if there is a gap between what people say they do and their actual behaviour, using ethnographic technology.
Processing

- Identification of the processing stages which have an impact on campylobacter numbers on broiler carcasses and chicken liver, to suggest modifications or interventions which will then be tested in collaboration with other projects and industry.

- A study being undertaken with industry to consider the effectiveness of interventions that are currently allowed (steam, hot water, rapid surface chilling, hot water plucking, electrolysed water, UV, electro-oxidation of scald water), as well as interventions not currently allowed (such as lactic acid, ozonated water and ozonated carbon dioxide pellets).

Monitoring

- Establish a proficiency testing scheme for laboratories measuring campylobacter numbers within the context of the risk management programme, and to collect and assess campylobacter test results and information from primary production and processing, and undertake multivariate analyses, to identify risk factors for campylobacter on carcasses.

- Monitoring for campylobacter in UK broiler slaughter batches and carcasses, to measure the effectiveness of the Agency’s risk management programme to achieve the target and to provide baseline data to feed into risk assessment models.

Molecular epidemiology

- A study to explore the source of campylobacter, the proportion of clinical isolates that are attributable to retail chicken sources, and to measure the impact of interventions on human campylobacteriosis in Scotland.

- Maintaining sentinel surveillance for human campylobacteriosis, including uploading of multilocus sequence typing (MLST) and whole genome sequencing of isolates onto a database, so that the impact of poultry industry interventions on the burden of human disease can be monitored.

Predictive modelling

- A systematic review of published literature on the survival of campylobacter in foods and food-related environments was carried out, to identify *Campylobacter coli* and *Campylobacter jejuni* strains to be used in challenge studies. The data will be used to model and predict the growth and survival of campylobacter in food and food related environments.

Under the joint research programme there are also projects being funded by BBSRC or jointly funded with the Agency, some with industry partners, which will address longer term strategy. An overview of the aims of these projects was presented by BBSRC.
We are committed to informing the public about food safety risks, so they are able to make informed decisions. In December 2011, we reminded consumers and food businesses that poultry livers carry a high risk of campylobacter. The bacteria can be present throughout the liver, and may remain a source of infection if they are not cooked sufficiently. Our advice emphasised the need to cook chicken livers thoroughly when making pâté, to reduce the risk of food poisoning. This advice followed a Health Protection Agency (HPA) investigation that revealed 90% of campylobacter outbreaks at catering venues were linked to undercooked chicken liver pâté. The number of sporadic cases of campylobacter associated with undercooked chicken liver pâté is unknown.

**Listeria monocytogenes**

*Listeria monocytogenes* is an unusual bacterium, capable of growing at low temperatures, including refrigeration temperatures of below 5°C. It is, however, killed by cooking food thoroughly and by pasteurisation. The bacterium, which may be found in chilled ready-to-eat foods, such as soft mould-ripened cheese, soft blue-veined cheese and pâté, can cause a rare but potentially life-threatening disease called listeriosis. Healthy adults are likely to experience only mild infection, causing flu-like symptoms or gastroenteritis. However, listeriosis can occasionally lead to severe blood poisoning (septicaemia) or meningitis. Those with reduced immunity, such as pregnant women, people aged 60 years and over, and people with specific underlying medical conditions and/or undergoing certain drug treatments, are at increased risk. Although the number of cases each year is low compared with other foodborne pathogens, the number of those cases that require hospital treatment is relatively high and it is estimated that around a third of all cases result in death.

![Figure 4: Laboratory-confirmed cases of *L. monocytogenes* in the UK, reported between 2000 and 2011](image-url)
There has been a decline in the number of UK laboratory-confirmed cases of *L. monocytogenes* from 176 in 2010 to 164 in 2011, although the number of laboratory-confirmed cases remains elevated above those observed in 2000, see Figure 4 on the previous page.

Although relatively rare compared with campylobacteriosis, listeriosis, caused by the bacterium *L. monocytogenes*, has a significant public health and economic impact and is estimated to cost the UK economy approximately £245 million a year. This is because most people who contract the disease have reduced immunity and are likely to need hospital treatment and it is estimated that around a third of all cases result in death. The Advisory Committee on the Microbiological Safety of Food (ACMSF) has previously recommended work to reduce the incidence of listeriosis in the over 60s.

Between 2000 and 2009, the annual number of laboratory-confirmed cases of listeriosis in the UK more than doubled. To combat this rise, as part of the Foodborne Disease Strategy, we developed our Listeria Risk Management Programme for 2010 to 2015, see text box below. In 2010 and 2011 there was a decline in the number of laboratory-confirmed cases of listeriosis. Our vision is that this programme will achieve a sustained reduction in the number of cases of, and deaths from, listeriosis in the UK by 2015.

### The Listeria Risk Management Programme

This is a coordinated programme of activities for 2010 to 2015 aimed at tackling listeriosis in the UK and developed in consultation with key interested parties.

We will be targeting our activities to the population groups, healthcare settings and industry sectors where the risk is highest, to achieve the greatest public health gains. The three work streams comprise activities to:

- **Raise awareness and promote behaviours and actions that can help prevent the disease among key vulnerable groups of the population and those who advise and care for them, focusing on cancer patients as a priority.**

- **Ensure the risk of listeriosis is considered as part of food procurement and food safety management in settings in which vulnerable people are cared for, focusing on NHS hospitals as a priority.**

- **Improve industry compliance with existing legal requirements for *L. monocytogenes* in foods, to ensure robust and consistent enforcement in this area, focusing on small and medium-sized enterprises dealing with high-risk foods as a priority.**

Partnership working will be key to the success of the programme. To aid this we have established a number of working groups, comprising partners and consultative experts from across government departments, health protection agencies, non-governmental organisations, the NHS, local authorities and the food industry.
The Listeria Research Programme for 2010 to 2015 was established to provide underpinning evidence to support the Listeria Risk Management Programme where necessary. The programme currently aims to provide robust information on the prevalence of *L. monocytogenes* in foods, as well as food safety practices which can minimise the risk from this pathogen. Additional relevant data gaps will also be identified and addressed.

In the past year, in Scotland we commissioned a comprehensive review of current practices in the management of *L. monocytogenes* utilised by manufacturers in the smoked fish sector. The final report of this work will be published later in 2012. The findings will help to inform the development of guidance and tools to help food business operators, in particular small and medium-sized enterprises and local food authorities, to better manage the risk of *L. monocytogenes* contamination.

We are also required by the European Union (EU) to assess the prevalence of *L. monocytogenes* in a range of ready-to-eat foods and have funded sampling of:

- packaged hot/cold smoked or gravad fish (cured in salt, sugar, and dill)
- soft and semi-soft cheeses
- packaged heat-treated meat products

The sampling work to provide this baseline EU data completed at the end of October 2011. The report of this work was transferred to the European Commission in May 2012.

**Norovirus**

Norovirus is the most common cause of infectious intestinal disease in the UK. It is highly infectious, with symptoms characterised by vomiting, diarrhoea, headaches, nausea, abdominal pains and occasionally low-grade fever. Although the illness is generally unpleasant, people usually recover fully within two to three days and there are no known long term effects that result from being infected. Many cases of norovirus are not related to a foodborne source.

We have been monitoring norovirus figures since 2005. Prior to this, the molecular methods which are now used for the diagnosis of norovirus were not in routine use by laboratories. There has been a decline in the number of laboratory-confirmed cases of norovirus from 15,529 cases in 2010 to 10,630 in 2011; however, it should be noted that 2010 norovirus figures were abnormally high and the overall trend is still increasing. In Scotland we also saw an unusual increase in the number of hospital related norovirus infectious in 2010. Figure 5 over the page, illustrates the UK incidence rates for norovirus since 2005.
There are currently significant gaps in our knowledge with regard to the proportion of norovirus infections related to the consumption of food. We aim to address this knowledge gap via the Foodborne Virus Research Programme, see text box below. The programme will undertake research to explore potential sources of infection, transmission routes and control options for foodborne viruses including norovirus.

The Foodborne Virus Research Programme

To develop an evidence-based Norovirus Risk Management Programme we require more robust underpinning scientific knowledge in this area. We have therefore committed to invest in the following:

- Research (already underway) to critically review the feasibility of methods for distinguishing infectious from non-infectious norovirus in food samples.

- Support funding for the VITAL project (Integrated Monitoring and Control of Foodborne Viruses in European Food Supply Chains),\textsuperscript{10} which was funded under the European Union 7\textsuperscript{th} Framework Programme. This complex project aims to identify routes of viral contamination of foods and assess potential controls with particular reference to Hepatitis A, Hepatitis E and norovirus.

- We anticipate funding a study to assess the contribution made by the whole food chain, including the role of food handlers to UK-acquired norovirus infections, to commence in 2012. This study should help to determine the relative contribution of different food sources and pathways to the overall norovirus disease burden in the UK.
- A project to develop a system dynamics model to help improve understanding of transmission routes of norovirus infection (already commissioned). This project will examine how the transmission routes for norovirus interact with each other, and how potential changes in volumes from different sources (both food and non-food related) are likely to impact on the overall levels in the population. The outputs from this work should help inform our understanding of the dynamics of the spread of disease and the potential impact of any interventions which may be identified.

- A systematic review on the survival of norovirus in foods and on food contact surfaces, and where appropriate and feasible, undertake a meta-analysis of the data.

We intend to hold a norovirus research workshop towards the end of 2012 involving a range of people from the research community, public and environmental health industry, consumer groups and funding bodies. The key aim of the workshop will be to identify the research priorities that need to be addressed to help develop further tangible risk management strategies.

Tackling norovirus in the food chain is likely to be challenging because of the different transmission pathways. Person-to-person spread is a key transmission route for norovirus, although some food and food handlers are also thought to be important sources, and further research is required to provide the evidence base to support possible interventions.

**Salmonella**

Salmonella are bacteria that cause food poisoning, typhoid fever and paratyphoid fever. More than 2,500 different types of salmonella have been identified. Anyone can get salmonellosis, but young children, the elderly and people whose immune systems' ability to fight infectious disease is compromised, or entirely absent, have a greater risk of becoming severely ill. Symptoms include watery diarrhoea, stomach cramps and sometimes vomiting and fever. These symptoms usually last for four to seven days and clear up without treatment. Transmission can occur by eating contaminated food, mainly of animal origin (meat, eggs, and dairy products) but also from fruit and vegetables, or by faecal contamination from an infected person or animal.

The number of laboratory-confirmed cases of salmonellosis across the UK in 2011 was 9,278, compared with 10,265 cases in 2010 and 16,606 cases in 2000, see Figure 6 over the page.
Figure 6: All laboratory-confirmed cases of salmonellosis in the UK, reported between 2000 and 2011

There has been an ongoing downward trend in the number of human cases of salmonellosis since the implementation of a vaccination programme for chickens in the late 1990’s and continued improvements to egg and poultry hygiene.

Many of the reported cases of salmonella infection in humans result from consumption of eggs, or dishes containing eggs, contaminated with *Salmonella Enteritidis*; however salmonella infection may also arise from the consumption of other food products including unpasteurised milk, meat, poultry, and fresh produce. Following an outbreak of *Salmonella Newport* linked to the consumption of watermelon in February 2012, we reminded consumers of our advice to ensure that all fruits and vegetables are washed prior to eating, to reduce the risk of possible illness.

A number of national control programmes are currently in place for the control of salmonella in eggs and poultry (breeders and layers), with further programmes to be implemented for broilers, turkeys and slaughter pigs. This work is led by Defra and devolved agriculture departments in the UK, although we actively participate in these activities.

Although there has been a notable decrease in the number of cases of foodborne illness, salmonella remains an important pathogen that still causes a large number of cases and is responsible for a significant number of outbreaks of human disease each year. We will continue to monitor the incidence of salmonella cases and outbreaks to ensure that the downward trend in case numbers continues, and take further action if the situation worsens.

We also continue to promote safe food preparation and handling to consumers through our Food Hygiene Campaign, including Food Safety Week, and to caterers
through initiatives such as ‘Safer food, better business’. These are used to address food safety and hygiene issues in the domestic and catering environments, to help reduce the incidence of foodborne disease generally, and the best practice advice takes into account a range of foodborne pathogens including salmonella and \textit{E. coli} O157.

\textbf{Escherichia coli (E. coli)}

\textit{E. coli} are bacteria which live in the digestive tract of humans and animals. Most \textit{E. coli} are harmless and do not cause serious illness. However, several \textit{E. coli} strains are pathogenic and can cause disease of the gastrointestinal, urinary or central nervous system. The most harmful group is called Verocytotoxin-producing \textit{E. coli} (VTEC) of which the most common strain found in the UK is \textit{E. coli} O157. \textit{E. coli} O157 can cause mild to severe illness characterised by abdominal cramps, vomiting and bloody diarrhoea. It can also lead to the serious conditions haemolytic uraemic syndrome and thrombotic thrombocytopenic purpura. These conditions affect the blood, kidneys and in severe cases the central nervous system and can even lead to death. Humans can become infected with \textit{E. coli} O157 through environmental exposure to animal faeces, the consumption of water from a contaminated supply, or contaminated foodstuffs. \textit{E. coli} related foodborne illness has been associated with undercooked burgers, contaminated produce (including sprouted seeds) and cross-contamination between raw meat and ready-to-eat foods.

There were 1,471 laboratory-confirmed cases of \textit{E. coli} O157 reported in 2011 compared to 1,072 cases reported in 2010, see Figure 7 below. This increase is primarily believed to be as a result of one significant outbreak. For more information on this outbreak see Chapter 3.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Figure7.png}
\caption{Laboratory-confirmed cases of \textit{E. coli} O157 infection in the UK, reported between 2000 and 2011\textsuperscript{c}}
\end{figure}

\textsuperscript{c}The peak in confirmed cases in 2005 corresponds to a major outbreak of the organism in South Wales. The peak in 2009 relates to a major outbreak in Surrey which was linked to animal contact at a farm and was not considered to be a foodborne outbreak.
We are committed to improving our science base in this area to reduce the public health impact of this pathogen.

The inquiry into the 2005 South Wales *E. coli* O157 outbreak recommended that control options to reduce the spread of the pathogen between cattle should be explored. At the end of November 2011 we invited scientific experts from across the globe to a workshop to discuss what we should do to improve our knowledge of *E. coli* O157, see text box below. A further workshop was held in January 2012 to investigate new developments in molecular biology that might be used to manage foodborne disease outbreaks.

**Research workshop on VTEC in cattle (Edinburgh, November 2011)**

The workshop aimed to identify what new research is needed to better understand how *E. coli* O157 colonises cattle, and how it is transmitted in the environment and into the food chain.

The workshop included presentations on the environmental factors that can affect the colonisation and transmission of *E. coli* O157 and the challenges involved in controlling the spread of the pathogen on farm. There were also discussions on intervention strategies that were being explored in other countries and the feasibility of introducing these in the UK.

Over fifty questions and statements collectively identified research gaps that need to be addressed. This list was further refined by the workshop participants to identify the key gaps in evidence that need to be addressed by us, and other research funders, to further understanding in this area.

The report from the workshop will be published later in 2012.

During 2011, one of the largest *E. coli* outbreaks reported worldwide and the largest ever reported in Germany occurred. This outbreak resulted in over 3,000 reported cases and over 40 associated deaths within the EU. In the UK 17 cases were identified, although they all had a history of travel to Germany. A second much smaller outbreak, caused by the same O104 strain, occurred in France in June 2011.

Investigating the source of the outbreaks proved difficult. We participated in a European Food Safety Authority (EFSA) Traceability Task Force, which co-ordinated efforts across the EU to identify the original source of the outbreak. The EFSA task force concluded that a batch of fenugreek seeds originally supplied from a company in Egypt to a distributor in Germany was the most likely link between the two outbreaks.

Between December 2010 and July 2011 in Great Britain there was also a separate outbreak of a particular subtype of *E. coli* O157 known as Phage Type 8 (PT8), associated with the handling of raw leeks and potatoes. We commissioned research
following these outbreaks that considered consumer attitudes and behaviour towards food safety when preparing vegetables, and we subsequently issued advice on washing vegetables (see Chapter 3).

The *E. coli* outbreaks illustrate the importance of ensuring the microbiological safety of food, and the challenges involved in investigating outbreaks. We are keen to explore new ways to identify, characterise and control foodborne outbreaks. One approach suggested by the General Advisory Committee on Science (GACS) was to use molecular epidemiology, a multi-disciplinary sub-specialty of epidemiology that incorporates the use of molecular, cellular, and other biologic measurements into epidemiologic evaluations, to investigate future foodborne disease outbreaks. We took this idea forward in partnership with the Health Protection Agency (HPA), Health Protection Scotland, the Biotechnology and Biological Sciences Research Council (BBSRC) and the Advisory Committee on the Microbiological Safety of Food (ACMSF) and held a workshop in January 2012, see text below.

**Workshop on the application of molecular epidemiology to investigations of foodborne disease outbreaks: current status and future plans**

The purpose of the workshop was to gain an understanding of how molecular biology could assist traditional microbiological and epidemiological approaches to outbreak investigations. Experts from key research organisations were brought together to discuss the current state of the science, how it is likely to develop over the next few years and to assess whether there are any specific gaps in knowledge and capacity that need to be addressed through research funding.

The key conclusions from the meeting were:

- High-throughput DNA sequencing can, and should be used, to assist outbreak investigation.

- Funding will be required from a variety of sources (The Food Standards Agency, Department for Environment, Food and Rural Affairs (Defra), Department of Health (DH) and funding councils) and should be allocated to ensure the efficient implementation of high-throughput sequencing to investigate outbreaks.

- Sequencing of historical samples does not need to occur before implementation of the technologies. It was agreed that sequence databases will become self-populating over time and that funding should be allocated to help build and maintain such databases and to sequence historical isolates to help populate the databases.

- The transition to sequencing is expected to occur in phases, with high-throughput laboratories and universities already using the technologies, reference laboratories expected to transition within two to five years and routine testing laboratories in the next five to ten years.
It should be possible to train current laboratory staff to generate the data, but analysis of the data will require further specialist training and expertise.

Interpretation software that is widely accepted, and easy to understand needs to be developed.

We need to engage with those developing clinical policy (Public Health England) to help reduce the timescales and improve consistency of testing and reporting.

It is anticipated that in the future, sequencing of relevant human, food and environmental samples using high-throughput methods will be applied as part of a foodborne outbreak investigation process.

1.3 Foodborne outbreaks

A foodborne outbreak is considered to have taken place when two or more people, from more than one household, or residents of an institution, suffer from the same disease caused by the ingestion of contaminated food, where the food is derived from the same contaminated source or has become contaminated in the same way.

Data from the Health Protection Agency’s (HPA) electronic Foodborne and non-Foodborne Gastrointestinal Outbreak Surveillance System (eFOSS), the Health Protection Scotland’s (HPS) ObSurv Surveillance System and the Public Health Agency in Northern Ireland, show there were 70 reported foodborne outbreaks, affecting 1,513 people, reported in the UK in 2010. The pathogens most often associated with foodborne outbreaks were campylobacter (27%), confirmed norovirus (20%), suspected norovirus (16%) and salmonella (13%).

Food was identified, by the public health organisations involved, in 81% of the outbreaks reported in 2010. The most commonly detected foods in the outbreaks were poultry meat (29%), crustacean/shellfish (21%) and red meat (14%). The most common foods associated with foodborne outbreaks in 2010 according to pathogens were:

- Poultry meat: campylobacter (80%)
- Crustacean/shellfish: norovirus\(^d\) (100%)
- Red meat: campylobacter (20%), norovirus (20%)

\(^d\) Includes both confirmed and suspect norovirus
Chapter 2: Chemical safety and dietary health

It is important that we monitor chemicals that occur naturally in food, and chemical and radiological contaminants, to ensure that food safety is not compromised and consumers are adequately protected.

We draw on both the natural and social sciences to develop, implement and assess our policy making decisions.

Chemical safety

We commission surveys of contaminants in food to ensure that exposure to these contaminants is kept below levels that are known to be harmful.

2.1 Consumer exposure assessment

Exposure assessment involves combining data on the level of a chemical or nutrient in the food and the consumption patterns of those foods, such as dietary data from the National Diet and Nutrition Survey (NDNS). The NDNS provides detailed, quantitative information on food consumption, nutrient intakes, nutritional status and related characteristics in the general population. Management of the NDNS transferred to the Department of Health (DH) in October 2010. The survey is managed by a project board which includes representation from all departments and devolved administrations with an interest in the survey, see text box below.

National Diet and Nutrition Survey (NDNS)

The NDNS, in its current form, was set up as a four year rolling survey, and has recently been extended for a further year 2012/13. The sample size for the survey is 500 adults and 500 children per year, covering all ages from 1.5 years upwards living in private households. It covers all four countries of the UK and is designed to be representative of the UK population.

The new rolling programme uses a four day estimated diary; previously the NDNS comprised a series of cross-sectional surveys, each covering a different age-group and it assessed diet that used weighed records of several days duration, seven days for adults and young people, and four days for children aged 1.5 to 4.5 years and people aged 65 years and over.
The most recent NDNS report published in July 2011 contains the results for years one and two combined of the new rolling programme (2008/09 and 2009/10). A supplementary report on blood analytes was published in October 2011. The supplementary report provides an analysis of blood samples which gives an indication of the nutritional status of the population over a longer period. The report presents descriptive statistics on a number of blood analytes, including iron and vitamin D, and focuses on respondents aged 11 to 18 and 19 to 64 years old, who agreed to a blood sample being taken. The results suggest that the overall picture of the nutritional status of the UK population is broadly similar to previous relevant surveys in the NDNS series carried out in 1997 and 2000/01. The results are consistent with the findings from the dietary data and do not indicate any new areas of concern in the nutritional status of these population groups.

We have funded a sample boost to the NDNS in Scotland, Wales and Northern Ireland in 2012, to collect detailed individual data on the nutritional intake and nutritional status of adults and children. A full report of results for years one to four is planned for publication in 2013. As we remain responsible for diet and health issues in Scotland and Northern Ireland, a separate report on the results from boosted samples in those countries will also be published.

The Diet and Nutrition Survey of Infants and Young Children (DNSIYC), led by DH, provides data between the age groups covered by the Infant Feeding Survey (also led by DH) and the NDNS. It aims to provide robust, detailed information on the food and nutrients consumed by a representative sample of UK infants and young children aged 4 to 18 months. We have funded a sample boost to the DNSIYC in Scotland and we aim to publish findings from this survey in early 2013.

The Agency in Scotland is also funding work to develop a computerised 24-hour recall tool. Development work will be used to assess the dietary intake of children and young adults living in Scotland. This will provide a cost effective means of obtaining robust data from a large number of participants of future Scottish dietary surveys. The new tool will replace the Food Frequency Questionnaire (FFQ) methodology used in the 2006 and 2010 surveys of diet of children in Scotland. This development project should report in 2014.

An alternative type of exposure assessment, which is more realistic, can be made by analysing a ‘total diet’. The Total Diet Study (TDS) is a market ‘basket-type’ survey in which foods representing the average UK diet (based on Defra’s Expenditure and Food Survey and trade statistics) are purchased, prepared and combined into groups of similar foods for analysis.

The Committee on Toxicity (COT) published a statement in May 2011 on the potential risks to consumers from dietary exposure to phthalates, estimated from 2007 TDS samples, see text box over the page. Phthalates may occur in food because of their presence in the environment as contaminants and through their release from plastic food packaging. Phthalates can interact with the hormonal (endocrine) control systems of the body, and in particular those that regulate reproductive function.
**Estimating dietary exposure to phthalates**

Samples from 20 food groups, comprising bread, fresh fruit, fruit products, dairy products, oils & fats, milk, nuts, beverages, meat products, offal, green vegetables, eggs, miscellaneous cereals, fish, sugar and preserves, canned vegetables, poultry, carcase meat, other vegetables, and potatoes were analysed for phthalates using gas chromatography-mass spectrometry.

Of the 26 different phthalates that were analysed in the TDS samples, only 8 were detected. These were:

- diethyl phthalate (DEP)
- di-isobutyl phthalate (DiBP)
- di-n-butyl phthalate (DBP)
- benzyl butyl phthalate (BBP)
- dicyclohexyl phthalate (DCHP)
- di-(2-ethylhexyl) phthalate (DEHP)
- monobutyl phthalate (MBP)
- mono-(2-ethylhexyl) phthalate (MEHP)

The estimates of dietary exposure were made by combining the measured concentrations of phthalates in different foods with data on patterns of consumption of those foods from the National Diet and Nutrition Survey (NDNS). The exposure assessments were performed using our in-house software package known as the Intake 2 Programme.

With the assumption that each food group contained a phthalate at the concentration at which it was measured in the TDS, an estimate was made of the total daily amount of the phthalate that each participant consumed. From the distribution of estimated exposures across all participants, high-level (97.5\textsuperscript{th} percentile) exposures were then derived, which represent estimated exposures for individuals who are among the highest consumers of the phthalates. Where a phthalate could not be detected in one or more food groups, two alternative calculations were made. In the first estimate, all undetectable concentrations were assumed to be zero (lower bound), and in the second, they were all assumed to be at the limit of detection for the method of assay (upper bound). High-level exposures were then each expressed as a range, with the lower bound derived under the first assumption and the upper bound under the second. The highest dietary exposures that might occur in different age groups were calculated for each compound and compared to the corresponding tolerable daily intake (TDI) where available. A TDI is the amount of a contaminant that would not be expected to cause appreciable harm in consumers, even if eaten every day, over a whole lifetime.
To assess the risk from total dietary exposure to phthalates, i.e., from the combination of all phthalates in the diet, the Committee on Toxicity (COT) assumed that the toxic effects of each individual phthalate would be similar, and that the combined toxic effect for a mix of phthalates could be estimated by adding together the exposure estimates for individual compounds.

The COT compared an estimate of the highest total exposures to all phthalates with the lowest TDI for any of the individual compounds, which was for DBP. The estimated total phthalate exposure was approximately twice the TDI for DBP. However, the Committee did not consider this to indicate a concern for consumer health since:

- most of the phthalates are less potent than DBP
- the TDI for DBP was likely to be very conservative
- DBP accounted for only approximately 5% of the total exposure to phthalates

Intakes of DBP, DEHP, BBP and DEP, estimated from the levels found in the TDS food samples, were all below their respective TDIs and did not indicate a risk to human health from dietary exposure.

The highest estimated exposures were for toddlers aged between 1.5 and 2.5 years. Exposures are likely to be much lower than those estimated, since the assumptions made in the exposure calculation were highly conservative.

Overall the COT concluded that levels of phthalates found in samples from the 2007 TDS did not indicate a risk to human health from dietary exposure alone. However, other non-dietary sources of exposure would need to be considered in a full risk assessment for phthalates.

Over the past year we have published the results of two food surveys, carried out to monitor levels of contaminants in food. These were the second wave of the mycotoxins survey and a survey of printing inks and mineral oils. These surveys provided valuable information on the levels of these contaminants from which it was possible to conclude that there were no specific food safety concerns. Further information on these surveys can be found in Chapter 4.

2.2 European food consumption data

The European Food Safety Authority (EFSA) has an important role in risk assessment and relies on accurate and comprehensive information relating to food consumption and eating habits of people across Europe. However, the national food consumption surveys from each of the countries use different methodologies. Combining the results of these surveys into an overall European food consumption database raises a number of questions. For example, there will be differences in the collection of data and the time frame of the surveys. Not all national surveys are
publicly available, making it difficult to publish results from such data. In addition food consumption surveys are often short in duration and to make the most from the information they hold, there is a recognised need to accurately predict long-term or ‘usual’ food intakes from the short duration of these surveys.

In February 2012 EFSA published a report of a pilot study to develop a ‘Compiled European food consumption database’. EFSA fed NDNS data from previous UK seven day records into this project, together with the consumption data from thirteen other countries. The pilot study has demonstrated the possibility to create a pan-European compiled database.

### 2.3 Food allergy and intolerance

Another aspect of our chemical safety work is to investigate the causes and mechanisms underlying food intolerance, including food allergy. Allergy and intolerance to foods are important and are not an uncommon complaint. These are adverse reactions to food that are reproducible and take place every time contact is made with a particular food or food ingredient.

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. Symptoms include swelling of the lips, tongue or throat, difficulty in breathing, diarrhoea, vomiting or on rare occasions anaphylaxis (a severe and potentially life-threatening reaction).

Food intolerance generally does not involve the immune system, the exception to this definition being coeliac disease, which is dietary intolerance to the protein gluten and does involve the immune system (but in a different way to food allergy). Symptoms are often mild and come on more slowly, sometimes hours after eating a food. Symptoms include bloating, stomach cramps and nausea. Although some of the symptoms to food intolerance can appear the same as an allergy they are generally not as severe as or immediately life threatening as a food allergic reaction, however, food intolerance can still make someone feel very ill and can significantly affect their longer term health and well being.

Current data for England, Scotland, Northern Ireland and Wales suggest that food intolerance is rising, see Figure 8 over the page. It should be noted that the vast majority of food intolerance cases do not require hospitalisation and as a result the true number of cases is likely to be significantly higher.
Figure 8: Trend in hospital admissions due to food intolerance in England, Scotland, Northern Ireland and Wales

As can be seen in Table 2 over the page, the vast majority of food intolerance cases requiring hospitalisation in England, Scotland, Northern Ireland and Wales are attributable to coeliac disease. Since 2001 the number of cases of coeliac disease requiring hospital admission has increased by over 65%.

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*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 2010-2011 are provisional.*
Table 2: Detailed annual breakdown of hospital admissions due to food intolerance in England, Scotland, Northern Ireland and Wales

Data for England, Scotland, Northern Ireland and Wales suggests that hospitalisation due to food allergy are increasing, see Figure 9 over the page. 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. Also 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.

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1 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 2010-2011 are provisional.
Since 2001 the number of hospital admissions in England, Scotland, Northern Ireland and Wales due to anaphylactic shock has nearly doubled, see Table 3 over the page.

Anaphylactic reactions are caused by the sudden release of chemicals, including histamine, from cells in the blood and tissues where they are stored. The release is triggered by the reaction between the allergic antibody and the allergen causing the anaphylactic reaction. In allergic individuals the mechanism is so sensitive that tiny quantities of an allergen can cause a severe reaction.

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 2010-2011 are provisional.
### Table 3: Detailed annual breakdown of hospital admissions due to allergic reactions to food in England, Scotland, Northern Ireland and Wales

<table>
<thead>
<tr>
<th>Year</th>
<th>Allergic contact dermatitis due to food in contact with skin</th>
<th>Irritant contact dermatitis due to food in contact with skin</th>
<th>Dermatitis due to ingested food</th>
<th>Anaphylactic shock due to adverse food reaction</th>
<th>Other adverse food reactions, not classified elsewhere</th>
<th>Number of hospital admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001-2002</td>
<td>32</td>
<td>1</td>
<td>138</td>
<td>763</td>
<td>1632</td>
<td>2566</td>
</tr>
<tr>
<td>2002-2003</td>
<td>36</td>
<td>3</td>
<td>188</td>
<td>847</td>
<td>1585</td>
<td>2659</td>
</tr>
<tr>
<td>2003-2004</td>
<td>59</td>
<td>1</td>
<td>195</td>
<td>879</td>
<td>1741</td>
<td>2875</td>
</tr>
<tr>
<td>2004-2005</td>
<td>67</td>
<td>0</td>
<td>240</td>
<td>998</td>
<td>1831</td>
<td>3136</td>
</tr>
<tr>
<td>2005-2006</td>
<td>50</td>
<td>1</td>
<td>265</td>
<td>1173</td>
<td>2149</td>
<td>3638</td>
</tr>
<tr>
<td>2006-2007</td>
<td>64</td>
<td>0</td>
<td>266</td>
<td>1265</td>
<td>2533</td>
<td>4128</td>
</tr>
<tr>
<td>2007-2008</td>
<td>48</td>
<td>0</td>
<td>274</td>
<td>1343</td>
<td>2701</td>
<td>4366</td>
</tr>
<tr>
<td>2008-2009</td>
<td>75</td>
<td>10</td>
<td>283</td>
<td>1300</td>
<td>2685</td>
<td>4353</td>
</tr>
<tr>
<td>2009-2010</td>
<td>74</td>
<td>2</td>
<td>273</td>
<td>1361</td>
<td>2548</td>
<td>4258</td>
</tr>
<tr>
<td>2010-2011</td>
<td>93</td>
<td>2</td>
<td>334</td>
<td>1419</td>
<td>2537</td>
<td>4385</td>
</tr>
</tbody>
</table>

Our approach to food allergy and intolerance has three main aims:

- to fund research that will help increase our knowledge and understanding of food allergy and intolerance
- strengthen food labelling rules to help people who need to avoid certain ingredients
- help raise awareness of food allergy and intolerance among caterers

To support these aims, we fund projects on fundamental, applied, clinical and social aspect of food allergy and intolerance to address identified policy needs. We have made significant contributions to enhancing our understanding of food allergy and

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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 2010-2011 are provisional.
intolerance and informing policy and advice. The Food Allergy and Intolerance Research Programme is scheduled to be reviewed in November 2012, where projects that have together made up the programme since 2008 will be reviewed to assess their productivity and success in terms of scientific quality, impact on policy and overall value for money.

We also work with a range of people to increase the awareness of food allergies and intolerances and improve the labelling of foods to help this vulnerable group of the population make safe food choices. We are working in partnership with other government departments to implement the Food Information for Consumers Regulation, which is designed to make labelling easier to understand. This regulation will improve the provision of information for the food allergic and intolerant consumer, as it introduces a new requirement for allergenic ingredient information to be made available on food sold non pre-packed, as well as the existing requirements for food sold pre-packed. These new requirements should make it easier for consumers to make safe food choices and are expected to reduce the incidence of adverse reactions requiring hospital admissions.

We are committed to protecting food allergic and intolerant individuals and to finding ways to assist them in making informed choices about the foods they purchase and consume.

The report of a joint symposium on ‘Frontiers in food allergen risk assessment’ that we organised along with the International Life Sciences Institute (ILSI) Europe Food Allergy Task Force in association with EuroPrevall, ILSI Health and Environmental Sciences Institute (HESI) and the Food Allergy Research and Resource Programme (FARRP) and with the participation of the European Academy of Allergy and Clinical Immunology (EAACI), was published in September 2011.25

The symposium encouraged discussions on the implications of some of the data arising from the European Union EuroPrevall project and related research, and identification of knowledge gaps to be addressed by future research. Further information on the EuroPrevall study and research we funded on the prevalence of food allergies from birth to two years of age is available in Chapter 4.

**Dietary health**

In October 2010 the responsibility for nutrition in England transferred to the Department of Health (DH) and in Wales to the Welsh Government. However, the Agency continues to advise and support Ministers in Scotland and Northern Ireland on nutrition policy.

In Scotland we support the Scottish Government’s National Food and Drink Policy, and their route map towards healthy weight – ‘Preventing Overweight and Obesity in Scotland’,26 by working to help improve Scotland’s diet and by providing effective support and expert nutrition advice to ensure consistent messages on all aspects of food policy including production and catering.
In Northern Ireland we are working in partnership with the Department of Health, Social Services and Public Safety and other relevant organisations to assist the implementation of the integrated outcomes of ‘A Fitter Future For All – Framework for Preventing and Addressing Overweight and Obesity in Northern Ireland 2012-2022’ report. The aim is to improve public awareness and use of 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.

2.4 Monitoring progress towards dietary targets

We have published the results of work to monitor progress towards the Scottish Dietary Targets. We use the UK Living Costs and Food module of the Integrated Household Survey (LCF), formerly the Expenditure and Food Survey (EFS), to monitor progress towards the Scottish Dietary Targets. Secondary analysis of Scottish household food and eating out data collected in the LCF/EFS was used to produce population level annual trends from 2001 to 2009. This has shown some evidence of progress towards achieving the targets for fruit and vegetables and brown/wholemeal bread, however, the incremental increases continued to be very small. There were small but significant decreases in saturated fat and non-milk extrinsic sugars (NMES) between 2001 and 2009. This secondary analysis programme is ongoing.

Salt intake can be estimated by measuring urinary sodium excretion. An Agency-funded survey based on a 24-hour urine measurement from a representative sub-sample of 800 adults in Scotland has found a mean salt intake of 8.8g/day. This was not statistically different from the mean salt intake from our 2006 urinary sodium survey (9.0g/day). Overall, 89% of men and 72% of women had a daily intake higher than the recommended 6g/day. Results are also similar to the 2008 UK survey where the mean salt intake was 8.6g/day.

Following the 2006 survey of sugar intake among children in Scotland, further work has been funded to track progress towards the Scottish Dietary Target for NMES consumption in children (which states that less than 10% of the total calories consumed by children should come from NMES). This survey, which will be published later in 2012, will establish whether there has been a reduction in NMES and fat intake since 2006 by children living in Scotland. In addition, the survey of children’s diets in Scotland will provide information on influences on children’s food purchasing behaviours.

Trans fatty acids (TFA) may occur in the diet as a result of consuming animal products or by consuming partially hydrogenated oils and fats. We have funded work to measure TFA levels in fats, oils and foods obtained from takeaway establishments in the most deprived areas of Glasgow City, to address claims that, despite recent reductions in trans fatty acid intakes in the UK population, those in the most deprived sectors of the population may still have high intakes of TFA, particularly as a result of consuming takeaway foods. The report will be published later in 2012.
2.5 Improving diets in Scotland and Northern Ireland

We fund work in Scotland and Northern Ireland to investigate and improve healthy eating messages.

In Scotland we funded research to investigate ways to increase the guidance around the ‘eatwell’ week sample menu. This sample menu was designed to meet current dietary reference values for energy, macronutrients and micronutrients, to comply with portion advice on fruit, vegetables and fish and to meet the Scientific Advisory Committee on Nutrition (SACN) recommendations for red meat and salt intake. The menu aims to demonstrate how healthy eating guidelines can be used to create a balanced diet over one week. The ‘eatwell’ week on the web project will take this menu and the accompanying messages and develop an easily accessible web resource. The new resource will be available to consumers online and it will also be to support work to develop our healthy eating messaging. The resource should be available in early 2013.

A programme of qualitative research commissioned by the Agency in Scotland and Northern Ireland investigated how consumers and health professionals understand healthy eating messages. In Scotland this work has highlighted that starchy foods are not valued as part of the diet and are not a consumer priority. Conversely, foods high in fat and/or sugar are ‘treats’ seen to form an enjoyable and essential part of the diet. The findings strengthen the case for improved messaging of the healthy balanced diet, and they show a role for industry in providing reformulated products which are lower in fat, saturated fat and sugar, as well as more competitive pricing and promotions on starchy foods, fruit and vegetables. Results from Northern Ireland suggested messages should be empowering so as to encourage behaviour change. The research also recommended other areas to be explored further, including: working with retailers and supermarkets; trying to improve people’s food and cooking skills and their understanding of planning ahead and budgeting; working with the media and publishers to ensure more responsible reporting of diet and nutrition features; compulsory training and/or regular workshops and seminars dedicated to teaching the principles of healthy eating for health professionals involved in providing dietary advice.

Research funded by the Agency in Scotland has highlighted inconsistencies within and between sources of healthy eating advice and found that the social context of eating is often ignored. The research concluded that there is considerable scope for improving the format and presentation of healthy eating advice.

To meet the specific needs of young people for nutrition information and guidance in Northern Ireland, we produced a dedicated document, ‘A survival guide to food’. We commissioned an independent evaluation of the guide in 2011, informed by the perspectives of students and teachers. The study also aimed to evaluate the marketing campaign promoting the guide. Feedback was very positive in relation to layout, colour graphics, humour, recipes, and students and teachers agreed the information had been pitched at the right level. The greatest use of the guide was evident in schools offering cookery as an enrichment topic within sixth form. The various marketing methods had limited impact; however, there was some evidence
of reported behaviour change by the students. The study did provide suggestions for future communication and promotion with this age group of student.

We also commissioned an evaluation of a Nutrition Award Scheme which has been piloted across 17 District Councils in Northern Ireland since 2010. The evaluation sought to better understand how the scheme has been implemented, and to assess the key emerging issues in relation to environmental health officers’ assessments, food businesses practices and, from the perspective of food business owners and managers, customer behaviours. Further details of the evaluation are included in Chapter 4.
Chapter 3: Turning science into policy and advice

As an evidence-based organisation we use inputs from a wide range of disciplines to underpin our policies and advice. In this section you can find out how the Agency:

- draws together information streams to support policy development
- uses evidence to review policy
- monitors and evaluates progress of policies to review and assess the impact

Developing policy

3.1 Modernisation of meat controls

Since 2009 we have been reviewing the current system of meat hygiene inspection in slaughterhouses and gathering the scientific evidence necessary to support a case for regulatory change. The overall objective is to improve public health protection while delivering a more risk-based and proportionate system for official meat controls. Current controls are 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. The main cause of foodborne disease today is microbiological and threats from bacteria such as campylobacter, salmonella and E. coli cannot be tackled adequately using traditional inspection methods.

We are taking forward a programme of work to deliver an enhanced system of official controls on meat. Different streams of evidence are feeding into this programme, and these are illustrated in the text box on evidence streams below (details of the review of the research carried out in the first phase are provided in a separate box).

**Evidence streams**

The first phase of research was put out to tender in November 2009, to examine certain assumptions on which the current system of meat official controls is based.

- Five projects were commissioned to study the potential risks to public health, animal health and animal welfare.
A key stakeholder group, which meets three times a year, was set up in June 2010 to inform our work to develop proposals for more risk-based and proportionate meat hygiene and TSE/SRM requirements and the official controls relating to those requirements. A series of 'Citizens' Forums' with consumers were organised in 2010 to seek consumers' views on current and future meat hygiene controls. A second tranche of research was put out to tender in February 2011 which includes: an evaluation of food chain information and collection and communication of inspection results for all species; a trial of visual inspection of fattening pigs from non-controlled housing conditions; a qualitative risk assessment of visual inspection of red meat species and farmed/wild large game; and a feasibility study to assess the use of plant inspection assistants performing post mortem inspection in approved game handling establishments.

Project reports from the first phase of research were reviewed in 2011 (see below).

An EFSA opinion on meat inspection for pigs was published in October 2011 as part of the European Commission mandate to review and modernise meat inspection.

In September 2011 we published the final reports of the research undertaken in the first phase of the programme (see text box below).

Review of the programme of research into the modernisation of meat controls

The objectives of each of the five projects completed in the first phase were:

Review of historical ante mortem and post mortem inspection data

To determine the critical and optimum data for cattle, pigs, poultry, sheep, goats and game species that should be collected to monitor current and most relevant public health, animal health and welfare conditions.

Comparison of post mortem inspection findings of outdoor and indoor fattening pigs: a qualitative risk assessment approach

To examine the risks to public health, animal health and animal welfare posed by visual inspection of fattening pigs from non-controlled housing conditions in relation to visual inspection of fattening pigs from controlled housing conditions.
Outcomes and value of current ante mortem and post mortem meat inspection tasks, and qualitative assessment of the benefit to public and animal health of post mortem inspection of green offal in red meat

To establish the effectiveness of inspection tasks, as described in Regulation (EC) 854/2004, in dealing with a range of significant hazards, and to assess the risk of removing or amending the requirement for inspection of green offal (the stomach, guts, mesentery, and gastric and mesenteric lymph nodes) for red meat animal species.

Assessment of the risk of official veterinarians not being present when plant inspection assistants carry out post mortem poultry inspection

To assess the risk to public health, animal health and animal welfare of amending the requirement that an official veterinarian must be present when plant inspection assistants carry out post mortem poultry inspection. A risk summary was developed to enable the effect of alternative supervision strategies to be assessed.

Assessment of the risk of an official auxiliary (rather than an official veterinarian) performing ante mortem inspections for poultry and young/prime red meat species

To analyse the nature of conditions detected at ante mortem inspection and the frequency of detection, as well as the competencies needed to detect these conditions, and to assess the risks of modifying the current requirements.

Each project was evaluated by independent experts in 2011; the key findings included:

- The Agency should actively promote the availability of inspection data, which may be of particular interest to producers, food business operators, veterinarians and the scientific community.

- The risk associated with visual-only inspection of fattening pigs from non-controlled housing conditions, as opposed to using incision techniques, was assessed to be negligible.

- There would be no significant increase in risk with a reduced official veterinarian presence during post mortem inspection of poultry by plant inspection assistants, provided the food business operator management systems were adequate.

- In general, ante mortem inspection plays an important role in the overall inspection process for red meat species. However, there would be no significant change in risk if an appropriately qualified non-veterinarian carried it out. The same appeared true for poultry ante mortem inspection.

- The current post mortem green offal inspection regime in red meat species is of limited value. In many instances, removing this specific inspection task would not make a substantial difference in terms of hazard detection or increased risk to public and animal health.
In May 2010 the European Commission requested EFSA’s assistance in providing the scientific basis for the modernisation of meat inspection in the EU. The outcomes of our research are being used to inform the work EFSA is undertaking.

Over the coming year we plan to commission further research to develop and test new approaches to risk-based inspection of meat.

### 3.2 Food hygiene delivery

Our Food Hygiene Delivery Programme covers all foodborne pathogens and all food groups, to support the strategic outcome that regulation is effective, risk-based and proportionate, as well as the outcome that food produced or sold in the UK is safe to eat. The programme was established in response to the recommendations made in the public enquiry report following the outbreak of *E. coli* O157 in South Wales in 2005, which identified serious breaches of the Food Hygiene Regulations by some food business operators.

One of the contributing factors to the outbreak was considered to be the nature of the food safety culture of food business operators. We have funded research to address the need to deliver a change in the attitudes and behaviours of business operators towards controlling the risks associated with cross-contamination between raw and ready-to-eat foods, for further details see Chapter 4.

We want to ensure that food safety is considered as a fundamental part of the procurement and monitoring of contracts for the supply of food into the public sector. The outcome of our research work in this area will be used to inform the approach taken in further research that will begin later this year, to review the various approaches to public sector food procurement in the UK.

### Evaluating policy

#### 3.3 Food hygiene standards

The Food Hygiene Rating Scheme (FHRS), which operates in England, Wales and Northern Ireland, is an innovative partnership between us and local authorities. The scheme, which is a key element of our strategic objective for safer food for the nation, aims to encourage businesses to improve hygiene standards and reduce the incidence of foodborne illness. Roll-out of the FHRS and the Food Hygiene Information Scheme (FHIS), a scheme with similar aims operating in Scotland have continued to be a focus this year, see text box over the page.
The Food Hygiene Rating Scheme (FHRS) and Food Hygiene Information Scheme (FHIS)

These schemes provide consumers with information about hygiene standards in food businesses at the time they are inspected by a local authority food safety officer to check compliance with legal requirements on food hygiene.

The FHRS has six ratings on a numerical scale ranging from ‘0’ (urgent improvement necessary) to ‘5’ (very good). Food outlets in Scotland that are included in the FHIS are given either a ‘Pass’ or an ‘Improvement required result.

The schemes help consumers choose where to eat out or shop for food and aim to encourage food businesses to improve standards. Businesses are also encouraged to display their rating/inspection result at their premises where they can be easily seen. Consumers can access ratings/inspection results online at www.food.gov.uk/ratings

The potential of these partnership initiatives to improve public health through behaviour change is widely recognised.\textsuperscript{48,49}

Success depends on local authority participation and this has gained a real momentum over the past year. In Wales all local authorities have implemented the FHRS, and across the three countries 94% of authorities are now running the scheme or preparing to launch it before the Olympics or shortly after. Looking forward, and on the basis of current information, it is anticipated that 97% of authorities, will have adopted the FHRS by the end of 2012 including all 26 district councils in Northern Ireland.

Scotland is also moving towards a national scheme as 21 of the 32 authorities are now running the FHIS and the remaining 11 are committed to adopting it (subject to agreement of Agency support with those authorities most recently coming on board).

We are committed to monitoring and evaluating the FHRS and the FHIS to review progress in implementation and to assess impacts. We have commissioned an independent evaluation. Work commenced in autumn 2011 and is due to be completed by mid 2014, see text box over the page.\textsuperscript{50}

In addition, quantitative research has been undertaken to assess the proportion of businesses displaying FHRS ratings at their premises in Wales. The results, published in October 2011, indicated that only 6% of businesses with a rating of 0, 1 or 2 were displaying this information where consumers could see it. Similar research has been undertaken in England, Northern Ireland, and in Scotland in relation to the display of FHIS ‘Pass’ results. The interim findings of the evaluation have recently been published.\textsuperscript{51}
Evaluation of the Food Hygiene Rating Scheme (FHRS)/Food Hygiene Information Scheme (FHIS)

**Evaluation design**

Independent advice was commissioned on how best to evaluate the FHRS/FHIS. As part of this work, workshops were held to define the underlying causal mechanisms for change and considered how these mechanisms are expected to produce desired short-term and longer-term outcomes. The resulting ‘theory of change’ was used to inform the evaluation hypotheses, research questions and research design.

**Aims**

The evaluation aims to assess the impacts of the schemes on: consumers; food businesses; local authorities; food hygiene compliance; and public health, and to assess how and why impacts are occurring.

**Impact evaluation**

This will assess the impact of the schemes on the incidence of foodborne illness and hygiene standards in businesses, taking into account a range of contextual variables and the impact of any existing local rating schemes. A range of data sources have been identified for evaluation, e.g., foodborne disease data and Local Authority Enforcement Monitoring System data.

**Process evaluation**

This will include interviews with Agency and local authority officers and a series of case studies in England, Wales, Northern Ireland and Scotland. These will allow an in-depth exploration of how the FHRS/FHIS are being implemented. A range of qualitative and quantitative research methods will be used to investigate the perspectives of local authorities, businesses and consumers.

**Advisory Group**

An independent Advisory Group comprising methodological experts and representatives from our Social Science Research Committee and UK-wide Food Hygiene Ratings Steering Group, has been set up to oversee the project and review key outputs.
3.4 Lifting radiation controls post-Chernobyl

We maintained radiation monitoring controls on over 300 sheep farms in England and Wales, since the Chernobyl nuclear power plant accident in 1986. In 2010, we began a review of the sheep monitoring programme, to inform whether the policy should change, which resulted in a proposal published in November 2011, see text box below.

New decision-making process to determine the need for restrictions on sheep\textsuperscript{53}

Improvements to radiation monitoring equipment and monitoring techniques have enabled a more accurate assessment of the levels of radiocaesium in sheep within the restricted areas. The more accurate assessment has been used to determine potential consumer doses, should control measures be lifted.

The previous policy, which had been in place since shortly after the accident in 1986, used a fixed level of 1,000Bq/kg of radiocaesium in sheep as a determination of risk. However, the 1,000Bq/kg level is not a safety limit in the sense that it is unsafe to eat any amount of meat above that level. Rather, it was used in the immediate aftermath of the Chernobyl accident as a means of controlling the maximum radiation dose (or risk) to which consumers could be exposed.

A study using a probabilistic dose model on the sheep monitoring data was carried out to estimate the distribution of dose for more highly exposed consumers of sheep meat from each farm in the restricted areas. This model allowed a more realistic assessment of consumer risks than the previous policy, which only considered the radiocaesium concentration in sheep. The distribution of dose to a range of additional consumers was also modelled to demonstrate a robust understanding of potential doses in different scenarios.

The main advantage of using a probability distribution is that it does not require every sheep to be monitored. Representative monitoring provides sufficient information about the distribution of radiocaesium in the whole flock. The dose estimates incorporate two categories of variability. The first incorporates the variability of the radiocaesium concentration in the flock. The second incorporates the variability in the consumer, such as purchasing habits, age and consumption rates.

A consumer could receive higher doses from consuming sheep meat from a farm where no sheep exceed the limit, but where the mean radiocaesium level is relatively high, compared with a farm where the mean radiocaesium concentration is low but a few sheep exceed the limit. Figure 10 over the page, shows the distribution of doses measured in millisieverts (mSv) that an adult high level consumer would receive, if they were to consume their annual supply of sheep meat from each monitored farm in Cumbria and North Wales.
The results of the dose assessment show that for the representative person, who represents the more highly exposed individuals, doses range from <0.05 to 0.21 mSv per year with an average of <0.09 mSv per year. This is significantly below the 1 mSv per year limit for members of the public exposed to radiation from routine planned exposures, and the 1 mSv per year reference level typically used in existing exposure situations.

The results of the sheep monitoring survey and the consumer dose assessment demonstrate that although low levels of radiocaesium persist in sheep throughout the restricted areas of Cumbria and North Wales, the consumer risks are very low.

We launched a full consultation based on the result of this risk assessment with a proposal to remove all remaining post-Chernobyl sheep controls, which closed in February 2012. After consideration of the consultation responses received, our Board agreed to accept this proposal in March 2012. As a result, all sheep monitoring ceased at the end of May 2012. A summary of all comments received from the consultation and our response to each has been published on our website.

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1 The limit for exposure to radiation from routine planned exposures is 1 mSv per year
Guidance and advice published

We use our science and evidence base to decide where practical guidance would be useful for consumers, food businesses and enforcement officers. Over the past year we have developed guidance for consumers and businesses and launched a consumer campaign on food safety issues.

3.5 *E. coli* O157 – A butchers’ guide to staying safe

We launched a DVD for those working in butchers’ shops in August 2011. The DVD was designed to encourage them to think about the type of food safety risks they face in their business and how they should control them and assist local authorities who carry out enforcement activity at butchers’ premises. It was produced as part of our response to the recommendations of the Public Inquiry into the serious outbreak of *E. coli* O157 in Wales in 2005, which was attributed to cross-contamination arising from the poor handling of food.

The DVD focuses on three key areas:

- the threat that *E. coli* O157 poses to businesses and their customers
- the importance of separation in controlling cross contamination
- the role of documented food safety management procedures in ensuring food safety and the ease with which they may be embedded into everyday working practices

3.6 Advice on washing raw vegetables

Following the *E. coli* O157 (Phage Type 8) outbreak in the UK in 2011 that was linked to the handling of loose raw vegetables (see section 1.3), we commissioned research that considered consumer attitudes and behaviours towards food safety when preparing vegetables. The results indicated that:

- the perceived risk of food poisoning from vegetables was low, whereas most consumers questioned were more cautious when handling raw meat
- there was limited awareness that cross-contamination from vegetables to other ready-to-eat foods was a food safety risk
- raising awareness of the risk of bacteria in soil would help people understand why they should wash and handle vegetables properly, without causing undue concern

We issued advice towards the end of 2011 to remind people of the need to wash raw vegetables, to help minimise the risk of food poisoning, see text box over the page.
Vegetables: best served washed

In Scotland and Wales\textsuperscript{59} during November and December 2011, we provided public health advice to encourage people to wash vegetables, and in Northern Ireland\textsuperscript{60} advice was issued during December 2011 and January 2012.

The key messages were:

- always wash hands thoroughly before and after handling raw food, including vegetables
- keep raw foods, including vegetables, separate from ready-to-eat foods
- use different chopping boards, knives and utensils for raw and ready-to-eat foods, or wash thoroughly in between preparing different foods
- unless packaging states ‘ready-to-eat’, you must wash, peel or cook vegetables before consuming

3.7 Advice on eggs

In December 2011, we issued revised advice on using eggs after their ‘best before’ date. The revised advice is that: ‘providing eggs are cooked thoroughly, they can be eaten a day or two after their ‘best before’ date’.\textsuperscript{61} Previously, the advice was that eggs should not be eaten after their ‘best before’ date, as eggs can sometimes contain salmonella bacteria. If salmonella is present in eggs, it could multiply to high levels and cause food poisoning. However, salmonella contamination levels in UK-produced eggs are low, and salmonella is killed by thorough cooking.

3.8 Allergy myth-busting tool

An internet tool aimed at dispelling myths about food allergy and food intolerance has been launched on the NHS Choices website.\textsuperscript{62} The tool which was developed with the help of our allergy team tackles the following topics:

- the differences between allergies and intolerances
- whether people can ‘outgrow’ allergies and intolerances
- the use of home-test kits
- whether allergies and intolerances can be cured
3.9 Consumer factsheet on gluten-free

Following Agency-funded research conducted in 2010 we published a factsheet in January 2012 to help consumers understand a new law on claims about foods for people who are intolerant to gluten. Any business that makes claims about gluten content has to ensure the food is labelled accurately and clearly, and must observe the defined strict low levels. This makes it easier for people with an intolerance to gluten (coeliacs) to be sure of what foods are safe for them. We also produced guidance for caterers on the new labelling term in May 2011.
Chapter 4: Research expenditure and highlights

Science and evidence

4.1 The science and evidence portfolio

We spend approximately £25 million on science- and evidence-gathering activities each year to ensure our advice, policies and regulatory activities are based on the best, and most up-to-date, independent scientific advice available.

In previous years this work has been managed under a number of different work-streams. During 2011 we restructured our science and evidence portfolio and its management to improve focus and to ensure we derive the greatest value for money from the evidence work we commission. We have produced a model which bases the structure along business organisation lines, see text box below.

Science and evidence portfolio restructure

We have broadened the definition of our externally commissioned science and evidence needs to ensure they provide information and/or data which will inform the maintenance, development, implementation or evaluation of Agency policies, advice or other outward facing actions (including our statutory functions). It includes natural and physical sciences research, analytical surveys, statutory surveillance, market and social research initiated from any area of the Agency.

Having organised the new structure along business lines we have a portfolio based on the following five high level programmes:

- Hygiene and Microbiology
- Chemical Safety
- Dietary Health and Nutrition
- Effective Risk-based Enforcement and Compliance
- Cross Cutting/Strategic

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1 This programme encompasses the relevant science and evidence groups related to our Foodborne Disease Strategy, Future Meat Controls and Food and Feed Hygiene Programmes.
The strategic planning, prioritisation and oversight of each of the work-streams will take place at programme level, and will be undertaken by newly created programme boards, whose objectives are:

- to undertake strategic discussion, planning, prioritisation and oversight of all activities in the programme
- to take a longer term view of the work to ensure it is linked to our overall strategy and that cross linking to other programmes occurs where necessary
- to provide guidance on the most efficient and effective management of the programme work-stream
- to monitor progress of the work and how the outcomes are utilised to inform strategic aims
- to conduct/carry out horizon scanning
- to ensure the body of evidence is reviewed systematically at an appropriate level of detail to ensure the outputs continue to meet our aims

We believe the new structure will underpin more coherent prioritisation and strategic planning of the portfolio, ensuring we adapt our science and evidence planning to take account of the wider pressures on resource.

**Spending on science**

**4.2 Portfolio spend 2011/12**

Each year we fund a wide range of scientific work to inform our decision making. We ensure scientific credibility and value for money of the science- and evidence-gathering work we commission through:

- The development and publication of the Science and Evidence Strategy 2010 to 2015, which offers a clear vision of how to meet the challenges of delivering safer food for the nation, supported by the annual Forward Evidence Plan.

- The co-funding of research, and partnerships with, other government departments and funding bodies such as the Research Councils in areas of joint interest.

- A rigorous tendering process, including peer review of proposals by external experts to ensure that we commission the best quality research, and within a framework on governance and use of science, on which we are advised by the independent General Advisory Committee on Science (GACS).
• The close monitoring of projects by programme managers and project officers.

In 2011/12 we spent about £25.5 million on commissioned science- and evidence-gathering work. Figure 11 indicates how this was divided across the new science- and evidence-gathering portfolio; with the largest proportion of the funding spent on work to ensure that food produced or sold in the UK is safe to eat. Summary tables with information about all the science- and evidence-gathering work funded by us in the past year, including financial information, can be accessed in Annexe A. [Drafting note: Summary table will be available prior to publication].

Figure 11: Science- and evidence-gathering portfolio spend 2011/12

We spent around £2.3 million on radiological monitoring and surveillance, around three quarters of which was subject to recovery from industry. We also spent around £4.4 million on shellfish and marine biotoxin monitoring and surveillance.

We continue to benefit from the opportunities afforded by collaborating with other funders, in the UK and internationally. In 2011/12 we provided £3.2 million to co-fund 24 projects, this represents approximately 12.5% of our total expenditure on research, further details of the projects co-funded can be accessed in Annexe B [Drafting note: Summary table will be available prior to publication]. We provided about £112,000 to EU projects with strong links to Agency needs. See Chapter 5 for more on the European Framework programmes.

In 2011/12 we spent approximately £1.7 million on dietary surveys which are used to inform chemical exposure assessments and support the Agency’s continuing responsibility for nutrition in Scotland and Northern Ireland.

Please note the percentages provided in the chart are provisional
Infectious intestinal disease

Infectious intestinal disease is a subset of gastroenteritis and is caused by a range of infectious microorganisms such as bacteria (e.g. campylobacter and salmonella), viruses (e.g. norovirus and rotavirus) and parasites (e.g. Cryptosporidium). Symptoms of infectious intestinal disease in otherwise healthy individuals are diarrhoea or vomiting or a combination of the two. It should be noted that there are a range of other conditions which may present with symptoms of diarrhoea and vomiting but do not involve an infectious intestinal cause.

The first Infectious Intestinal Disease (IID) study carried out in the mid-1990s showed that the public health impact of gastrointestinal infection is significant. The results of a second study (the IID2 study), which we funded with contributions from the Department of Health and the National Health Service, aimed to see whether the burden of disease and relative importance of different organisms causing infectious intestinal disease has changed. The results were published in September 2011. Since not all cases of infectious intestinal disease are foodborne, we are funding further work to estimate the burden of foodborne disease and to update the models currently used to estimate foodborne disease. The results are expected in 2012.

The Second Study of Infectious Intestinal Disease in the Community (IID2)68

One of the key objectives of the first study of infectious intestinal disease in the community (IID) was to determine a conversion factor to multiply the number of reported cases of infection, to estimate the actual number of infections in the community.

Since the original study was undertaken, several structural changes have occurred in national laboratory surveillance reporting which might have altered the validity of the conversion factor to a greater or lesser degree. We subsequently funded a second study (the IID2 study) to:

- Provide up-to-date data on the incidence of infectious intestinal disease in the UK.
- Identify the main microorganisms which cause infectious intestinal disease.
- Determine whether the burden of infectious intestinal disease has changed since the original study was carried out in the mid-1990s.
The key findings were:

- The incidence of infectious intestinal disease in the community in the UK is substantial, with around one in four of the population suffering from an episode of infectious intestinal disease in a year, up to 17 million cases annually. Around 2% of the population visit their GP with symptoms of infectious intestinal disease each year – an estimated one million consultations annually.

- Approximately 50% of people with infectious intestinal disease reported absence from school or work because of their symptoms, resulting in nearly 19 million days lost (over 11 million days lost in people of working age).

- The most commonly identified microorganisms found in stool samples from those with infectious intestinal disease in the community were norovirus (16.5%), sapovirus (9.2%), *Campylobacter* spp. (4.6%) and rotavirus (4.1%).

- The most commonly identified microorganisms found in stool samples from those with infectious intestinal disease presenting to GPs were norovirus (12.4%), *Campylobacter* spp. (13%), sapovirus (8.8%) and rotavirus (7.3%).

- For every case of infectious intestinal disease in the UK reported to national surveillance there were around 10 GP consultations and 147 cases in the community.

- Only one specimen out of 715 tested positive for *Clostridium difficile* (<1%), suggesting that this microbe, that causes a lot of disruption in healthcare settings, is not found very often in the community at large.

- The incidence of infectious intestinal disease in the community in England was 43% higher in 2008/9 (IID2) than in 1993/6 (IID1), however, the number of people visiting their GP about infectious intestinal disease was 50% lower.\(^1\)

- Reporting of infectious intestinal disease to national statistics has improved since the first IID study, for those presenting to their GP with symptoms, suggesting that GPs are more likely to take a stool sample and/or there have been improvements in recording episodes of infectious intestinal disease for those using primary healthcare services. However, fewer people are visiting their GP for an episode of infectious intestinal disease. Therefore more cases in the community now go unrecognised and, therefore, unreported.

- A very small proportion of people with infectious intestinal disease (~2%) contacted NHS Direct, but this contact was insufficient to account for the observed drop in rates of consultation to general practice.

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\(^1\)The reasons for the increase in incidence rate of infectious intestinal disease in England and why people suffering from infectious intestinal disease are not consulting their GPs cannot be determined from the IID2 study, as it was beyond the scope of the work. This may be an area that warrants further investigation.
The findings of these two rigorous and comprehensive studies of infectious intestinal disease will help us and other government departments prioritise areas of work with the aim of reducing levels of infectious intestinal disease in the UK. They will also enable us to update our estimates and monitor foodborne disease in the UK, to identify the microorganisms of greatest significance to public health and target our Foodborne Disease Strategy on reducing these microorganisms in the food chain. The study also provides confirmation that we are correct to have made campylobacter a key priority in our 2010 to 2015 strategic plan.

**Norovirus in UK oyster harvesting areas**

We funded a study as part of our Foodborne Virus Research Programme which aimed to provide a better understanding of the contribution made by the whole food chain to UK acquired norovirus infections. It specifically aimed to address the previous lack of quantitative data on the prevalence, distribution and levels of norovirus in oysters and oyster production/harvesting areas within the UK.

Consumption of raw or lightly cooked bivalve shellfish is a recognised risk factor for norovirus illness (gastroenteritis). This is because, if the water in which shellfish grow is contaminated, norovirus can accumulate in the shellfish due to the way they filter water to feed.

Between 2009 and 2011, with the support of the shellfish industry, we funded the collection of samples of oysters from classified oyster production areas in the UK to gather data on the levels and prevalence of norovirus contamination in harvesting areas, see text box below. We reported the results of this project in November 2011.69 The data generated from our study will help to inform risk management strategies and support development of a future EU standard for norovirus in live bivalve molluscs.

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**Investigation into the prevalence, distribution and levels of norovirus titre in oyster harvesting areas in the UK**70

Monthly samples of Pacific and native oysters from 39 commercial production areas around the UK were tested for norovirus genogroups I and II. Sites included in the study were selected using a risk matrix to ensure a representative selection of likely contamination levels.

The key findings were:

- All sites tested provided at least one norovirus positive result, although prevalence varied from 21% (5/24) of samples to 100% (20/20) of samples.

- Norovirus was detected in 76% (643/844) of samples, with a similar prevalence in the two species of oysters tested, however, levels detected in the majority of positive samples 52% (335/643) were below the limit of quantification.
There was a marked seasonality with a positive detection rate of 90% (379/421) for samples taken between October and March compared with 62% (264/423) for samples taken between April and September.

As with prevalence, average quantities also varied markedly between seasons, with highest levels detected between December and March.

It is difficult to assess the potential health impact of these findings, as the currently available research techniques are not able to differentiate between infectious and non-infectious genetic norovirus material within the oysters. Furthermore, a safe limit for norovirus in food has not been established. However, this data is extremely useful in establishing base line levels and prevalence of norovirus in production sites in the UK.

The data obtained from this project are considered by European experts to be among the best available, and they were submitted to the European Food Safety Authority (EFSA) to inform its opinion on ‘Norovirus in oysters: methods, limits and control options’.71

We recognise the limitations with the methodology currently used for detection and quantification of norovirus in foods in the inability to determine whether norovirus detected is infectious or not. To address this we have funded a critical review of methods for distinguishing between infectious and non-infectious norovirus to establish if this is feasible.72

Assessing compliance with our advice

We are working closely with the UK poultry industry and retailers to develop targeted actions along the food chain to reduce levels of campylobacter in UK-produced poultry. In 2008, we funded an initiative to provide training on key biosecurity messages to poultry catchers in Scotland and Northern Ireland, as previous studies had indicated that the consistent application of stringent biosecurity measures was essential for the control of campylobacter colonisation in poultry flocks. In December 2011, we published the results of research conducted with the poultry catching industry, carried out to assess whether the key messages delivered have been applied by poultry catchers in a consistent manner, see text box below.

Assessing the effectiveness of biosecurity training73

Researchers interviewed poultry catching teams and farm managers to identify any changes in biosecurity measures that have been adopted by catching teams since biosecurity training was delivered in 2008. Observational studies were also undertaken to determine how biosecurity measures were actually being implemented.
The results confirmed that poultry catchers appear to have an improved knowledge on the principles of biosecurity, with 78% having a good understanding of the principles compared with fewer than 50% in 2008. However, only 43% indicated they had heard of campylobacter, although this was an improvement on the level of understanding in 2008, when it was estimated that fewer than 25% had heard of campylobacter.

The study identified a number of areas where poultry catching teams need to make further improvements to hygiene practices, such as disinfecting vehicles going on and off site, and wearing clean clothing on entering the farm.

Many of these measures have been incorporated into the Red Tractor Farm Assurance Poultry Standards,\(^7^4\) which provide assurance about food safety, animal welfare and environmental protection. However, recommendations for areas where the standard may be further tightened have been made.

### 4.4 Chemical safety

**Surveillance programme for mycotoxins**

Mycotoxins are naturally occurring chemicals which are produced by certain fungi growing on food crops during production and subsequent storage. They can occur in a wide range of foods, including cereals, nuts, spices, fruit, coffee, milk and alcoholic beverages, and at any stage throughout the food chain. Mycotoxins can cause a range of adverse health effects. The European Union has set maximum levels for mycotoxins to minimise consumer exposure through food. The results of the first year of the surveillance programme, which investigated the levels of mycotoxins in cereal based retail foods were published in 2010.\(^7^5\) The results of the second wave of this programme were published in 2011, see text box below.

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**Mycotoxins in food survey – year two\(^7^6\)**

**Mycotoxins in food products for infants and young children**

Samples of food products produced for infants and young children were analysed for mycotoxins. A total of 20 mycotoxins including aflatoxins B1, B2, G1, G2 and M1, ochratoxin A (OTA), patulin, fumonisins, zearalenone (ZON) and the trichothecenes deoxynivalenol (DON), nivalenol (NIV), and T2 and HT2 toxins (naturally occurring by-products of *Fusarium spp.*) were included in the analysis.

**Results:**

- aflatoxin B1 was detected in 1 sample of the 77 samples (1%) analysed
- aflatoxin M1 was not detected in any of 19 samples analysed
• OTA was detected in 13 of the 77 samples (17%) analysed at levels ranging from 0.05 to 0.45μg/kg

• zearalenone was not detected in any of the 77 samples analysed

• DON was detected in 28 of the 77 samples (36%) analysed at levels ranging from 10 to 217μg/kg

• NIV was detected in 4 of the 77 samples (5%) analysed for at levels ranging from 11 to 37μg/kg

• other trichothecenes (diacetoxyccirpenol, 3-acetyldeoxynivalenol, 15-acetyldeoxynivalenol, fusarenone X, neosolaniol and T2 and HT2 toxins) were not detected in any of the 77 samples analysed

• fumonisins were not detected in any of the 7 samples analysed

• patulin was not detected in any of the 19 samples analysed

• none of the samples contained mycotoxins above the maximum legal levels

Ergot alkaloids in cereal and cereal-based products

One hundred samples of cereal-based products were analysed for the ergot alkaloids: ergocristine, ergotamine, ergocryptine, ergometrine, ergosine and ergocornine; and their ‘-inine’ forms. The ‘-inine’ forms have the same molecular formula and sequence of atoms as the ‘-ine’ form, however, the three-dimensional orientation of their atoms in space is different. Any such differences can result in changes in the physico-chemical properties of the substance and it is therefore important to know the quantities of each toxin present.

Results:

Ergot alkaloids were detected in 12 of the 100 cereal products analysed (12%) including organic wholemeal bread mix, rye flour, self raising flour, wholemeal flour, multi-seeded bread, multi-grain crackers, organic rye flakes, wheat germ, and wholegrain pasta. In the samples in which ergot alkaloids were detected, the total levels ranged from 2 to 169μg/kg. There are currently no maximum levels set for ergot alkaloids in cereals or cereal products for direct human consumption. The data from this survey have been submitted to contribute to EFSA’s risk assessment of ergot alkaloids and will help inform future EU discussions.

Patulin in apple juice

Twenty five apple juice and juice-based products were investigated for the presence of patulin.
Results:

Patulin was no
tdetected in 23 of the samples analysed (92%), however, patulin
levels of 3.8μg/kg and 96.8μg/kg were detected in two apple juice samples. The EU
maximum permitted level for patulin in fruit juices, concentrated fruit juices and fruit
nectars is 50μg/kg. We informed the supplier that the affected batch of apple juice
exceeded the maximum level for patulin and the affected batch was voluntarily
destroyed.

Overall, the results of our mycotoxin surveys do not raise concerns for consumer
health in the UK.

Migration of printing inks and mineral oils into food packaging

Components of printing inks, such as colorants and pigments, binders (materials that
hold the printing inks together), additives (such as plasticisers which make the ink
flexible within the packaging) and photoinitiators (chemicals used in printing inks to
speed up the drying process of the ink using ultra violet light) may transfer into food.
Mineral oils may also transfer into food from a number of sources. Small quantities
are present in some adhesives, where they are used as de-foamers. Also mineral oil-
based inks have been used for food packaging in the past and they continue to be
used to print newspapers. Recycled newspapers are sometimes used in the
manufacture of carton-board food packaging materials. If foodstuffs are packaged in
these materials mineral oils may migrate into the food. In December 2011, we
published the results of our survey of printing inks and mineral oils,77 see text box
below.

Survey of printing inks and mineral oils78

This survey investigated the migration of components from printing inks used on carton-board packaging into
food. There was also a screening exercise to ascertain whether mineral oils were present in carton-board
packaging materials.

Food samples were tested for 20 printing ink substances, selected on the basis of
previous knowledge of their potential to migrate from food packaging into food.

Results:

- Benzophenone, which is a photoinitiator, was detected in 37 of the 350
  samples (11%) tested.

- Other samples contained mixtures of one or more of 1-hydroxycyclohexyl
  phenyl ketone, ethyl-4-dimethylaminobenzoate, 2,2-dimethoxy-2-
  phenylacetophenone, methyl-2-benzoylbenzoate, 2-ethylhexyl-4-
  dimethylaminobenzoate and 4-phenylbenzophenone.
Some packaging materials contained mineral oils. The levels found were similar to those reported in previous published literature. Mineral oil saturated hydrocarbons were detected in all 51 samples tested and concentrations of mineral oil aromatic hydrocarbons exceeded the limit of detection in 17 of the 51 samples (33%).

Only limited toxicological data is available for many of the substances obtained from printing inks included in this survey. Our risk assessments of these substances at the levels found in the foodstuffs are based on available toxicological data and the published EFSA opinion on benzophenone.⁷⁹

The most extensive toxicological evaluation of mineral oils was carried out by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) in 2002.⁸⁰ The risk assessment based on this evaluation did not identify any concern for human health from the dietary exposure to these chemicals. The risk assessment assumed that food containing mineral oil from packaging could be consumed daily and that the substances found in packaging could potentially migrate into food. This approach is thought to over-estimate the potential risk to consumers. On this basis we do not consider that the presence of mineral oils in the packaging at the levels found indicate any specific food safety concerns. EFSA also published its opinion on mineral oils in June 2012;⁸¹ we will review the EFSA opinion in depth and will consider if further work is needed to protect consumers.

Infant food allergy

There is a lack of reliable data on the actual, as opposed to reported, occurrence of food allergies in the UK, especially among children.

As part of a larger European Union project we funded research to investigate the prevalence and patterns of food allergies in infants in the UK, and how diet in early life might be associated with the development of food allergy, see text box below.

Prevalence of infant food allergy (PIFA)⁸²

The PIFA study is part of a much larger scale European Union (Framework Programme 6) project called EuroPrevall⁸³, which is investigating ‘The prevalence cost and basis of food allergy in Europe’. The EuroPrevall project has the overall aim of improving the quality of life of those with food allergy.

Part of EuroPrevall is concerned with gathering accurate information from across Europe on the patterns of prevalence of food allergies in infants, children and adults. The PIFA study forms the UK birth cohort of EuroPrevall.

Data from a cohort of 1197 infants have been collected on the occurrence of food allergies from birth to two years of age and on the infant weaning practices adopted currently by mothers in the UK.
UK results suggest that nearly a third of parents perceived their child had a food allergy during those years. However, when these infants underwent the gold standard test for food allergy (a double-blind, placebo-controlled food challenge) it was confirmed in one in twenty infants. The commonest foods giving rise to reactions were cows’ milk, egg, peanut, soy, wheat and fish.

An initial analysis of the pattern of weaning in those infants who developed food allergy, suggests that:

- they were introduced to solids earlier
- they were less likely to be receiving breast milk while starting a cows’ milk formula or starting solids
- they followed a less diverse diet
- infant feeding guidelines had not been followed

In June 2011, data from this study were submitted to EuroPrevall, making it possible to compare the UK prevalence and experience of food allergy in the first two years of life with data from the other nine European EuroPrevall birth cohorts. Publications from the analyses should be available towards the end of 2012 along with the final report from the PIFA study.

4.5 Dietary health and nutrition

Pilot study to assess the ‘Nutrition award scheme’ in Northern Ireland

The ‘Nutrition award scheme’ was launched in Northern Ireland in 2010 as a pilot within 17 District Councils. The scheme comprises of a three tiered – gold, silver and bronze – award. Awards are allocated based on the total score achieved from an assessment form which is completed by Environmental Health Officers, see text box below.

The ‘Nutrition award scheme’

We commissioned a study to evaluate the pilot scheme. The results indicate that 90 per cent of food businesses taking part in the pilot believe the scheme is a good approach to helping people eat more healthily when they eat out.

Of those food businesses taking part 91 percent plan to continue participating in the scheme, however, there was a perception that the scheme was poorly resourced and substantial funds would be needed, especially for promotion, for the scheme to be successful. Nearly
all the businesses recognise the importance of the aims of the scheme and are highly motivated to continue improving their scores next time around.

Environmental Health Officers thought the scheme was a good idea and would work well as consumers were becoming increasingly aware of the need to maintain a healthier lifestyle. Recommendations for improvement highlighted the need to:

- promote awareness and a positive orientation toward the scheme among food businesses and consumers alike by means of: a promotional campaign, a communication strategy and a convincing business case for participation
- provide food businesses with a short leaflet rather than the full guidance documents at the outset
- ensure consistency and standardisation in the assessment process to achieve robust results and reduce any perceptions of unfairness
- meet training needs, in particular on sections and scoring on the assessment form, refresher courses on food nutrition, and some minority ethnic cuisine specific training

Most food businesses believed that there are direct business benefits associated with achieving a high award, providing a dual motivation to participate and succeed, with benefits accruing to both the businesses and their customers. A number of themes relating to scheme improvements emerged from the food businesses, including:

- a perceived need to tailor the assessment forms to different types of food premise
- calls for local authority led advertising campaigns
- more detailed menu support and advice
- greater clarity of the steps needed to achieve each award level

The results of the evaluation of the ‘Nutrition award scheme’ provide encouragement that a national roll out throughout Northern Ireland is likely to deliver positive benefits.
4.6 Effective risk-based enforcement and compliance

Compliance with regulatory hygiene standards

We fund research that contributes to our understanding of what works to secure regulatory compliance. In January 2012, we published research that aimed to sense check the findings of an Agency-funded evidence review\(^6^4\) published in 2010 on regulation cultures and behaviours. A small number of food sector experts, including large food businesses, food safety consultants and academics were approached to provide responses to in-depth interviews, see text box below.

**Qualitative research exploring regulation cultures and behaviours\(^8^5\)**

This new piece of qualitative research aimed to:

- Sense check the findings of the previous review on regulation cultures and behaviours.
- Confirm that there were no major omissions in the review.
- Start to fill the gaps identified in the literature, namely: why are large businesses more likely to comply, and how do other regulators achieve compliance?

The interviews revealed broad agreement with the key findings of the evidence review. However, the following areas were not necessarily reflective of respondents’ own experience:

- Large businesses may have proportionally lower compliance costs than small and medium-sized enterprises.
- UK food regulators tend to take preventative, conciliatory approaches towards those companies or individuals responsible for conforming to the regulations.
- Tensions can occur if enforcers occupy the dual role of educator and enforcer.

Several factors were considered to deserve greater attention, including:

- The importance of high-level management commitment to creating a successful compliance culture, in particular having a motivated person in charge.

The research also found:

- Achieving compliance was perceived to involve meeting some necessary conditions. These include businesses must be motivated to comply, understand how to comply, and be able to comply. The development of an
effective compliance culture was regarded as important to secure and sustain compliance.

- Large businesses were considered better placed to comply, as there is a greater motivation to do so, a better understanding of how to comply, and available resource to meet needs. However, a committed small business may still be able to create a compliance culture.

- The ideal enforcement approach is to involve a partnership model, which involves working with the business to achieve compliance and prevent risks, but the use of more rigid styles of enforcement should be used as required.

- Multi-channel communication between business and regulator is important to support compliance, with face-to-face communication seen as ideal to build relationships, but supported by written communications that are clear and jargon free.

### 4.7 Cross cutting/strategic research

**Surveying attitudes and behaviours to food**

We currently have two regular surveys which track people’s attitudes and behaviours towards food. The Food and You survey collects robust quantitative data to allow a comparison of attitudes and behaviours between different groups within the population, and how these attitudes and behaviours change over time. This survey will play an important role in helping us monitor our strategic priorities, as subsequent waves of data are collected. The first wave of results, published in March 2011, show that the majority of respondents reported they follow recommended practices in cleaning, cross-contamination, chilling and cooking. However, many respondents did not follow our advice that raw meat and poultry should not be washed; there was also a lack of knowledge around safe food storage, and some uncertainty about the best way to tell whether food was safe to eat.

Once we have the results of further waves of the survey, we will be able to examine the data to try to determine what influences people’s attitudes and behaviours in the fields of food safety and healthy eating. The results of the second wave of the survey undertaken in 2012 are expected to be available at the end of the year.

We also fund the biannual Public Attitudes Tracker survey, which was redesigned in 2010. This allows us to monitor changes in consumer attitudes towards food-related issues and enables us to monitor the level of consumer awareness and trust the public have with regard to the Agency and our remit. The results of the third wave of the tracker survey were published in January 2012, see text box over the page.

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[^m]: Since October 2010, we no longer have responsibility for nutrition in England and Wales, however, we do have responsibility for nutrition policy in Scotland and Northern Ireland
The survey covers concern about specific food issues and attitudes towards food safety, awareness of hygiene standards in eating establishments, awareness of the Food Standards Agency and our responsibilities, and trust in the Agency.

The results of the third wave, see Figure 12 below, indicated that the main food safety issues of total concern, that is spontaneous and prompted responses combined, for respondents were:

- food hygiene when eating out (36%)
- food poisoning such as salmonella and \( E. \ coli \) (30%)
- the use of additives in food products (26%)
The Public Attitudes Survey was first run in March 2001. Since then, several changes have been made to questions and the design of the survey. The time series data should therefore be interpreted with some caution.

Base: all respondents who reported being aware of the hygiene standards of places they eat out at or buy food from.
The results of the survey also indicated that fewer people were concerned about food safety issues than other food issues, such as food prices (60%), the amount of salt in food (46%), food waste (43%) and the amount of fat in food (40%).

It is important that we have a good understanding of how different people behave and the various factors that might influence risky behaviours. This will enable us to provide information and advice to the public on how they can protect themselves from food poisoning in their own homes.

Work is underway to explore domestic food practices. In August 2011, we published an evidence review to explore what is currently known about food safety behaviours in the home. The ‘Food and You’ survey will provide more baseline data on stated domestic food safety behaviours and we are funding further research in 2012/13, which includes vulnerable groups, to find out more about what people do in their homes and the reasons why. This study will explore kitchen practices in 20 case study households via a mixed method approach, including observation, interviewing and kitchen mapping. The pilot study started in January 2012, and the main study will commence later in the year.

\[^P\] Red circles indicate a statistically significant change for these concerns from the previous wave (May 2011) of the Tracker, reported at the 95% confidence level
Chapter 5: Working with the wider scientific community

Scientific collaboration

5.1 Partnerships
We recognise the importance of partnership working in our Strategic Plan and Science and Evidence Strategy.

![Diagram showing partnership working](image)

**Figure 13: Partnership working**

We published a ‘Research and innovation strategy for campylobacter’, together with the Biotechnology and Biological Sciences Research Council (BBSRC), Defra and others in 2011. A range of projects have now been set up with each of the key funders, which seek to identify issues and solutions at a variety of points in the food chain (see Chapter 1). This partnership enables funders to work together in a co-ordinated and coherent way to tackle the complex research issues needed to address the issue of campylobacter in the food chain.

The overarching aim is to reduce the incidence of campylobacter infection in humans through reductions in:

- the level of the bacterium in farm-animal hosts
- the potential for cross-contamination throughout the food chain
By working with industry this partnership will ensure that the research is applicable to industrial practices, thereby increasing the likelihood that potential control measures will work in an industrial setting.

We have also developed a new initiative with the Medical Research Council (MRC). We have developed a Memorandum of Understanding, setting out the mechanisms by which projects will be commissioned, managed, funded and reported. A joint call for research to help improve understanding of the biological mechanisms that cause food allergies closed in May 2011. Unfortunately the call did not lead to any new work being funded at this stage. We are working with the MRC to consider ways to take this forward, to identify opportunities which would allow greater synergy between basic immunology and food allergy research and which would help address the current scientific challenges that food allergy presents.

In 2008, we formed 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. We committed funding to the Understanding Society Study, which will enable us to include questions in future waves of the work, to help understand the impact of social, economic and health-related behaviours and life events on individuals’ eating habits.

5.2 Co-funding and data sharing

In the Chief Scientist Annual Report 2010/11, we provided details of the development of an Agency ‘Framework for sharing scientific data or funding with external partners’, which was developed by the General Advisory Committee on Science (GACS).

Our Strategic Plan and Science and Evidence Strategy highlight the importance of making effective use of existing data. However, we must weigh potential benefits, such as improving the evidence base and sharing costs, against the need to ensure the quality of the data and the Agency’s independence, in the development of such arrangements.
The draft framework, endorsed by the Board in March 2011, was the subject of a full public consultation from May to September 2011. The results of the consultation and the proposed response developed by GACS were considered by the Board at the January 2012 meeting. There was general support for the principles and framework, and comments on a range of specific points. GACS used the responses to clarify and improve parts of the framework and a template for agreement between funders was incorporated into it. The revisions do not alter the key principles (see text box). Decisions on sharing data and funding with industry and non-government organisation (NGO) partners will need to be taken on a case-by-case basis, but the framework allows us to do this in a structured and consistent way, and makes our principles and approach clear to all interested parties including potential partners.

Framework on use of external data not in the peer-reviewed literature and co-funding of research with industry and interest groups

In determining whether and how to use external data, or to co-fund research with external partners, five principles must be considered:

- Decisions made by the Agency and the advice that it gives should be based on the best available scientific evidence.
- The Agency should be trusted by the public and perceived as independent of commercial and other external interests.
- The Agency’s activities should be efficient, maximising value for taxpayers’ money.
- Commercial confidentiality and intellectual property rights should be respected, especially where there is a resultant public benefit.
- Costs for research should be distributed fairly across beneficiaries.

The General Advisory Committee on Science identified three scenarios in which use of data collected by industry or NGOs is acceptable: where the data are submitted in response to Agency consultations; where they are produced in the context of a rigorous system for monitoring compliance with safety requirements; and where they are submitted in support of regulatory risk assessment and the regulatory system is suitably robust.

In other circumstances, decisions on the use of externally generated data should be made on a case-by-case basis, balancing between the five guiding principles. Where this is done, the rationale for the decision should be clearly argued and publicly available.
Provided suitable systems of governance are in place, the resultant gain in research capacity would offset any greater administrative burden and threat to the Agency’s perceived independence, it would be acceptable for the Agency to fund research jointly with industry or NGO partners. Co-funding with commercial or NGO partners in other circumstances is not recommended.

5.3 European Framework Programmes

We co-operate with and co-fund work under the European Union’s Framework Programmes on research. The seventh Framework Programme (FP7) for Research and Technological Development, is the EU’s main instrument for funding research across Europe.

Since the inception of the Framework Programmes they have steadily increased in size and scope, and FP7 has a total budget of some €50 billion from 2007 to 2013. Discussions are underway on proposals for its successor, Horizon 2020. A UK position paper on priorities for the Horizon 2020, was published in May 2011. We are actively involved in discussions at UK and European level on the new programme, which includes a proposed societal challenge on food security and sustainable bio-resources, see text box below.

Horizon 2020

The Horizon 2020 Programme will run from 2014 to 2020 with a proposed budget of €80 billion. It will be based on three main objectives:

- excellence in science base
- tackling societal challenges
- creating industrial leadership and competitive frameworks

The diagram over the page shows the currently proposed organisational structure for Horizon 2020, split between these three main areas.

There are six key areas of research identified to tackle societal challenges, with the health and food security themes being the ones of key interest to us. The aim is to bring together resources and knowledge throughout multi-disciplinary collaborations, which include the social sciences and humanities.

Funding for the European Research Council (ERC) supports blue-sky research and there will also be support for the market take-up of innovation. The proposed funding for the Future and Emerging Technologies (FET) will promote research co-operation across disciplinary boundaries. There will also be a focus for leadership in enabling and industrial technologies, including ICT and nanotechnologies.
The programme is still under negotiation within the European Parliament and the Commission, however final agreement and approval of Horizon 2020 is expected in summer 2013.

5.4 European Food Safety Authority (EFSA)

EFSA was set up in 2002 as an independent source of scientific advice on existing and emerging risks associated with the food chain. Over the last ten years, EFSA’s scientific work has played a key role in EU risk assessment regarding food and feed safety. During 2012, EFSA’s 10th anniversary year, it will be looking to the future, as new trends and emerging issues are affecting the nature and volume of EFSA’s work. There will be an increased focus on multidisciplinary scientific advice, development of new risk assessment methodologies and further national and international cooperation.
One of EFSA’s priorities is enhanced cooperation and networking in Europe. EFSA’s Management Board has approved a list of organisations capable of assisting EFSA in its tasks. This is in line with Article 36 of EFSA’s Founding Regulation and its implementing rules. Networking with competent organisations enables EFSA to use a wide range of scientific expertise in Europe, which helps it to respond more effectively and flexibly to its workload.

The Article 36 organisations, which are designated by Member States, are invited to undertake tasks including:

- data collection
- preparatory work for scientific opinions
- other scientific and technical assistance

EFSA announces calls for proposals to support them in carrying out the requested tasks, and awards grants to these organisations.

In March 2012, we held an event for UK Article 36 organisations to explain the grant application, selection and award process and to encourage greater participation.

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**Article 36 workshop**

The Article 36 contacts list is a pre-qualified list of organisations that have applied for and been accepted as qualified to help support the scientific work of EFSA. The Agency is the UK focal point contact for EFSA and we invited all current UK Article 36 contact organisations to meet with representatives of EFSA to discuss scientific cooperation and funding under the Article 36 mandate.

Topics included:

- EFSA tasks and role in food safety
- the different grant and procurement tools used by EFSA, including an overview of the Article 36 grant process
- how to become more engaged with EFSA utilising the Article 36 network, information exchange platform and expert database
- how EFSA plans and prioritises funding its work and what decides the funding mechanisms
- ways to facilitate joint bids from two or more organisations, when a combination of skills and expertise is needed
- sharing experience of applying for EFSA grants
The meeting provided participants with an understanding of the background to, and mechanics of, the different routes available to cooperate with EFSA and the different opportunities for funding scientific work that supports the remit of EFSA. It also enabled those Article 36 organisations who had undertaken work for EFSA using the grant system to feedback their experience.
Chapter 6: Science governance and strategy

Science- and evidence-gathering process and review

6.1 Process and systems

We have over the past year introduced changes to the science- and evidence-gathering process to ensure we derive the greatest value for money in the evidence work we commission. Our aim is for the efficient use of the resource in the procurement, management and use of evidence. Part of these changes included the introduction of new electronic systems for the procurement and management of evidence-gathering projects.

The new procurement package includes a collaborative system to facilitate the full lifecycle of the tendering process for science- and evidence-gathering work. ‘Calls for tender’ are submitted through the system and automatically loaded onto tender advertising portals such as the Official Journal of the European Union and Tenders Electronic Daily. All information on procurement opportunities are available on the electronic Public Procurement System (ePPS), existing contracts are also made publically available, and can be accessed through the Contract and Project Management system (CPMS) website. We do not publish commercially sensitive information or information that may be used to obtain an unfair competitive advantage.

The new management package provides our project and programme managers with everything they need, in one place, to actively monitor and manage research contracts. The system enables financial and other key management information to be accessed by our accounts, procurement and senior management teams. In future we envisage that the system will also be used to assess and review the research work we have funded.

6.2 Peer review

Peer review of our science- and evidence-gathering work is essential, to validate the results of the work and to help establish the quality of the work we fund. Peer review helps to minimise the risk of us acting on information which is subsequently shown to be erroneous, which could damage the trust which we have established.

Our current mechanisms are:

- publication in peer-reviewed scientific journals
- peer review and scrutiny of findings by our scientific advisory committees or other independent experts

- publishing draft advice or assessments for consideration by all interested parties, including the wider scientific community

Under the new science and evidence procurement system, peer review is also required for all proposals.

Innovations such as open access provide other opportunities to improve our approach. We encourage our contractors to publish the results of Agency-funded work in open access peer-reviewed literature. Research contractors also prepare a final project report which is published, after peer review by Agency staff and by external experts, in our open access repository Foodbase. This is particularly important where the results are not published in peer-reviewed literature.

The issue of peer review in scientific publications has also been considered by the House of Commons Science and Technology Committee during the past year. An inquiry report, published in July 2011, considered evidence on the operation and effectiveness of the peer review process used to examine and validate scientific results and papers prior to publication, see text box below.

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<tr>
<th>Science and Technology Committee; Peer review in scientific publications</th>
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<tr>
<td>The conclusions and recommendations of the House of Commons Science and Technology Committee review are:</td>
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- There are considerable differences in quality of pre-publication peer review as used by most traditional journals.

- New innovations in pre-publication review are being introduced that have the potential to accelerate the pace of research communication and avoid duplication of effort by the research community. Publishers should share best practice where possible, particularly in relation to data management and in terms of promoting publication ethics and research integrity.

- The publication of peer-reviewed articles not only helps to maintain a robust scientific record, it also has an impact on the careers of researchers and the reputations of research institutions. However, the inquiry was assured by research funders that they do not use journal impact factor as a proxy measure for the quality of research or of individual articles.

- The growth of post-publication peer review and commentary represents an opportunity for use of new media and social networking tools. Online communications ensures that interesting research is spread across the world, facilitating rapid commentary and review.
The prudent use of online tools for post-publication review and commentary should be encouraged as a means of supplementing pre-publication review.

6.3 Underpinning data

Over the past year we have amended our publication policy. We recognise that data are a valuable resource which may have significant value beyond the original research. By making underpinning data available it allows further analyses and it also allows for interpretations derived from the data to be tested.

Our aim is to provide the following three important benefits and a consistent approach for the release of underpinning scientific data, subject to legal constraints:

- **Transparency**
  - others can see the results generated by our programmes, which are funded by public money

- **Scrutiny**
  - the evidence and analysis that inform our policies are open to others to check and challenge

- **Improving the wider evidence base**
  - by making data available in usable format, we will allow others to build further on the work we have done and get added value from the work

This approach is in line with the Government’s wider transparency agenda, which aims to open up access to data held by government bodies, to enable people to find and re-use data in innovative ways. Discussions are underway across government on how the principles of the transparency agenda can best be applied to scientific data.

The House of Commons Science and Technology Committee considered the publication of data as part of its inquiry into peer review in scientific publications (see text box above). It recognised there are technical and economic challenges of data storage but it concluded that in order to allow others to repeat and build on experiments, researchers should aim for the gold standard of making their data fully disclosed and made publicly available.

A number of other organisations are currently considering the issue of access to research data and the practicalities of making scientific data freely accessible. The Royal Society is undertaking a project, Science as a Public Enterprise, which aims to identify:
• the principles, opportunities and problems of sharing and disclosing scientific information

• the measures that should be taken by scientists and their institutions, policy makers and others, to create a socially responsible open access regime

A report of the study, which will consider the potential risks, benefits and costs of making scientific data more widely accessible, is expected to be published in 2012.

We recognise there are significant practicalities that need to be considered, before we are able to finalise detailed recommendations of an agreed Agency policy. However, our General Advisory Committee on Science (GACS) has agreed that we should encourage contractors to publish underpinning data, as fully and as quickly as possible, in an open accessible format. We have therefore agreed some general principles for the release of underpinning data from new science- and evidence-gathering research that should be applied now, see text box below.

Our principles for the release of underpinning data from science- and evidence-gathering work

The following are the key principles that have been endorsed by the General Advisory Committee on Science (GACS):

• Data should be made freely available in an accessible format, as fully and as promptly as possible.

• Consideration should be given to data management as new contracts are being negotiated. Resource implications for this should be taken into account.

• The mechanism for publishing underpinning data should allow the widest opportunity to enable its re-use.

• Where possible, underpinning data should be included in the final project report. Where data are included in the final report in pdf format, they should also be published separately in a format that can be used for further analysis. Large data sets can be provided separately in an annexe to the report, and published, where possible, alongside the final report on Foodbase, the Agency’s research repository.

• Where it is more appropriate to publish underpinning data in an existing database, archive, repository or other community resource, or for data to be saved in a specialist proprietary format, information will be provided on how the data can be accessed.

• There will be some circumstances where release of data may need to be restricted or anonymised for reasons of commercial and/or personal sensitivities.
We will follow the progress of the wider government and scientific community discussions on open science, and we will update and finalise our policy on underpinning data in light of these discussions.

The scientific advisory committees

Our General Advisory Committee on Science (GACS) provides a forum for discussion and co-ordination across the work of each of the scientific advisory committees (SACs). GACS has also continued to build on its crucial role, in providing independent challenge and advice on how we use science in all areas of our work.

6.4 Review of the scientific advisory committees

The independent reviews of the SACs continued in 2011. The aim is to determine ‘whether each committee fulfils its intended function and whether all the current committees are still needed’. Independent reviews of the Advisory Committee on the Microbiological Safety of Food (ACMSF) and the Committee on Toxicity (COT) were completed in 2011. Our responses to these reviews, prepared in discussion with the SAC secretariats, were endorsed by GACS at its November 2011 meeting, and they were subsequently agreed by our Board. The reviews concluded that there is an ongoing need for the ACMSF and for the COT, with value for us and for other organisations. In each case, the reviews identified areas of good practice, and concluded that the scientific quality of the work of these committees, and the support provided by the secretariats, were of a high standard. Each review also offered recommendations for how the committees can maximise the value of their work for us and other government departments and organisations.

Four of the recommendations touch on general issues, which may be relevant to the other SACs that also provide us with advice, see text box below.

**General recommendations arising from the review of the Advisory Committee on the Microbiological Safety of Food (ACMSF) and Committee on Toxicity (COT)**

The following recommendations were considered relevant to all the scientific advisory committees (SACs):

- the process for determining the work programme should be improved and a forward work plan published with proposed timescales for the work

- that the committee takes greater steps to show evidence of scientific rigour by using the Agency’s Good Practice Guidelines and Science Checklist more explicitly, and also routinely considering whether peer reviews are appropriate for work on which the committee’s decisions are based

- that new members have an induction meeting with the secretariat
• there is a need to clarify the role and responsibilities of the assessors on the committee

The ACMSF\textsuperscript{110} and COT\textsuperscript{111} agree with these recommendations and have published their own responses to these and to the more specific recommendations relevant to each committee.

The Agency also agrees with each of these recommendations and has suggested ways to improve practices for the other SACs.\textsuperscript{112}

Reviews of the Advisory Committee on Novel Foods and Processes and of GACS\textsuperscript{113} were carried out in 2011 and will be reported later in 2012.

### Science governance in the Agency

We have been reviewing our procedures for science governance: the methods by which we assure and demonstrate that scientific evidence and analysis are sought, obtained, interpreted, used and communicated appropriately and effectively by the Agency.

Whilst no major concerns or weaknesses with the current procedures were identified by ourselves or via independent evaluation, we considered it timely to review how our procedures have worked in practice, and to decide what if any changes are needed, see text box below.

*The review of science governance in the Agency*

The overall aims are to:

- review and revise the Science Checklist and review the need for any updates to the Good Practice Guidelines for the SACs
- identify any other changes to the current procedures or tools to ensure effective science governance
- produce a clear updated statement on our approach to risk assessment and risk management reflecting the conclusions of the review
- to report to the Board on our science governance, summarising the outcomes and any proposed changes, at the July 2012 meeting

The wider government Code of Practice for Scientific Advisory Committees (CoPSAC) was updated in November 2011.\textsuperscript{114} CoPSAC is a framework that provides guidance on the establishment, management and conduct of SACs and their
relationship with the bodies that they advise, including good practice in their operation in the provision of support and advice to Ministers and sponsoring departments. GACS fed into the Agency’s response to the Government Office for Science consultation on the revision of the 2007 CoPSAC. The response highlighted among other things the importance of openness and independence of operation, and effective coordination across committees.

The review of science governance in the Agency has led to the development of checklists of issues that a risk assessment in an incident may need to consider.

### 6.5 Risk assessments in incidents

We have a lot of experience and expertise in carrying out risk assessments in incidents. We work to an Incidents Response Protocol, updated in May 2012, which describes the key elements of the process, such as details of notification procedures, roles and responsibilities during incidents, and arrangements regarding closure and review.\(^{115}\)

Risk assessment is an essential part of incident response. Once a hazard has been identified and characterised, an exposure assessment is carried out to consider the likely exposure to a chemical, allergen or pathogen from all relevant sources and uses, in order to estimate average and high level daily intakes. It may focus on particular subgroups with expected higher intakes, such as children or those eating a particular type of diet. The exposure estimates are compared to known health based guidance values, to characterise the risks posed to consumers and any high risks groups. This information, along with any gaps and uncertainties, is then considered by our risk managers who decide on the most appropriate form of action, such as product withdrawal or recall.

Our incidents protocol for managing incidents contains some pointers on key elements of risk assessment. We have developed two checklists that highlight in more detail the issues that a risk assessment in an incident may need to consider. We will use these to build on current good practice to ensure a consistent approach across different incidents.

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**Risk assessment in handling incidents**

Risk assessment in incidents is subject to specific challenges:

- **time pressures** – initial assessments and decisions on risk management and communication may be needed within hours of the first information on the incident

- **incomplete information** – data on key elements of the risk assessment are likely to be incomplete with high levels of uncertainty with regard to its reliability and completeness, including the source, nature or level of the potentially harmful agent and the extent of exposure
rapidly evolving situations – the only certainty is that the picture is likely to change rapidly over the coming hours and days, so risk assessment will need to be updated regularly

Risk assessment in incidents needs to consider the risks to the robustness of the assessment from the limited and rapidly changing data, as well as the risks to health based on what the available data tell us. It should also help risk managers identify needs for further information, and prioritise actions to collect the information that will be of most use in managing the incident response, including in developing the risk assessment further.

Two checklists have been developed, reflecting two broad types of incident:

- A potentially harmful agent is detected in food or in another medium from which it may reach food, or the potential for this to happen is identified. We need to assess which foods are affected and what this means for consumers. These tend to be chemical incidents, but may relate to other agents such as allergens or pathogens, or ingredients present inadvertently or at excessive levels. Or, the incident may start with the identification of a real or potential failure of controls which could lead to contamination of food or exposure of consumers.

- Symptoms or adverse effects are reported in people (or animals) which may be associated with exposure from food. We need to identify the causal agent, the source, and the extent of risks to consumers from food. These tend to be microbiological, but may also be related to other agents – such as allergens, or chemicals causing acute effects.

6.6 Risk assessment and risk management

A clear distinction between risk assessment and risk management (and between the provision of independent, expert advice and decision-making) is a key principle of good science governance.

The scientific advisory committees (SACs) play an important role in carrying out independent, expert risk assessment, which involves identification and characterisation of hazards and the risks associated with that hazard in a specific situation or course of action, and of the attendant uncertainties. SACs may also comment on the risks and benefits associated with different options for managing these risks.

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. This process requires judgements on the possible outcomes, and it has been argued that such judgements should reflect, or at least take into account, the values of the parties who
will be affected by the decision. Decisions on risk management are developed by the Agency.

It is often difficult to separate risk assessment from risk management entirely. The GACS set up a ‘Working Group on Risk Assessment and Risk Management’, to consider good practice. It is important to have a consistent approach to how scientific evidence and advice is generated and used, to inform the decision-making process, and evaluate policies across the Agency, see text box below.\textsuperscript{116}

\begin{quote}
**The GACS Working Group on Risk Assessment and Risk Management**

A pilot study was carried out that illustrated some useful points on understanding and practice across the SACs and how the key players interpret the terms ‘risk assessment’ and ‘risk management’. It concluded that it is unrealistic to separate risk assessment from risk management completely, therefore the aim should be to optimise the degree of separation according to circumstances.

The working group advised:

- we should continue to promote the principles laid out in the Royal Society report\textsuperscript{117} of its joint workshop with the Agency held in 2005, on social science insights into risk assessment

- the reviews of the SACs should include an assessment of adherence to those principles

- we should encourage more extensive interchange of information between risk assessors and risk manager

- we should ensure that risk assessors always begin their task with a good understanding of the risk management decisions that their assessments will inform

The GACS also agreed that it may be appropriate in some circumstances for SACs to advise on issues related to risk management that are within their remit and expertise, for example in offering expert commentary on implications for risk assessment of risk management options, such as where there might be unintended consequences.

These issues are being considered as part of the review of science governance. We will publish a statement on our framework for science governance later in 2012.

We have also co-ordinated a working group of the heads of national food agencies across Europe, looking at transparent use of risk assessment in decision making, and in particular how to avoid misuse of uncertainty to justify decisions based on other factors. The working group will publish its report later in 2012.
6.7 Scientific developments for chemical risk assessment

The Committee on Toxicity (COT) has considered a new scientific development known as toxicogenomics for use in the human health risk assessment of chemicals. Toxicogenomics is defined as the study of the structure and function of the genome as it responds to chemical exposure. It includes studies of the ways in which chemicals can increase or decrease the activity of individual genes, or changes in the proteins or other molecules produced by those genes, where there may be distinctive patterns associated with particular chemical effects.

The COT considered the types of data generated so far by toxicogenomic approaches, to advise on how the data could contribute to our risk assessment process. A case study of the use of toxicogenomic data in human health risk assessment was considered in September 2011, see text box below.

### Toxicogenomic approach to human health risk assessments

A United States Environmental Protection Agency (EPA) report, that considered a toxicogenomic approach to the risk assessment of dibutyl phthalate (DBP), was considered by the COT.

The COT indicated that the EPA report was a useful reference document, suggesting that DBP possessed an exceptionally large number of toxicogenomic datasets in comparison with most substances that might be evaluated. Even so, it was difficult to draw conclusions of relevance to risk assessment. Members commented that there were limitations to what could be derived from historical toxicogenomic studies, which had been designed for purposes other than risk assessment. Ideally, experiments would be designed to address specific questions in risk assessment, using a range of doses to support dose-response modelling. The view was that if conclusions for risk assessment could not be drawn from a toxicogenomic evidence base the size of that for DBP, it would be even more difficult to make use of historical studies for substances which had been investigated less.

The Committee considered that the EPA’s proposed framework for using toxicogenomics in risk assessment was useful, but emphasised that it would best be applied to studies designed to answer specific questions. The overall view was that this approach was still in evolution, and was not yet a refined tool that could easily be interpreted.

6.8 Assessing and communicating uncertainty

The COT has developed a framework for assessing and communicating uncertainty. The framework aimed to help increase transparency of communications between risk assessors, risk managers, and others including the
public. An evaluation of the framework was carried out for the Agency to provide a social science perspective.\textsuperscript{121} It evaluated existing research to consider how people understand uncertainty and how this affects the framework.

There are various ways of expressing uncertainty but social science research generally makes no distinction between these, and it suggests that people do not either. The COT framework therefore focused on the relative merits of different formats of uncertainty expression.
Chapter 7: A strategic approach to the future

Emerging risks

As well as tackling food safety through coordinated activities at a national level, we have also established closer links with food safety authorities at the international level. It is important that we take a coordinated approach to intelligence gathering to identify emerging risks.

Our Emerging Risk Programme aims to provide a co-ordinated approach to the collation and analysis of intelligence, to relate the identification of potential new and re-emerging risks to food safety. This work will provide a clearer picture of when, why and how food safety issues develop and we will use the analyses to predict new and re-emerging risks to food safety and to build our knowledge of new technologies and novel foods.

Much of the work so far has been focused on developing the necessary methodologies and these are now operational. We held a public event in March 2012, as part of the National Science and Engineering Week, to highlight our continued focus on science and the importance of our horizon scanning and emerging risk work, see text box.\textsuperscript{122}

The Identification of future global food risks

We organised an event at the Royal Society that brought together experts to describe the work currently being undertaken to better understand potential risks to food safety and security. The presentations explored the following themes:

- the use of horizon scanning and futures research methods to track and identify emerging and re-emerging risks within our global food chains
- an assessment of the risk of introducing exotic zoonotic diseases (disease transmitted by animals) into the UK as a result of the global movement of food
- the identification of potential threats to global food safety using the European Rapid Alert System for Food and Feed (RASFF)
- the work the Agency is currently undertaking in detection of new and re-emerging food safety risks

The presentations were followed by a panel debate, including representation from industry. The theme was ‘What drives food safety in our global supply chains?’
7.1 New horizon scanning centre

We are involved in collaborative work, to identify possible risks before they emerge and are partners in sponsoring a new Centre for Environmental Risk and Futures (CERF), see text box.  

Centre for Environmental Risk and Futures

The Agency is a partner in the Defra-led partnership sponsoring a Centre for Environmental Risk and Futures (CERF) at Cranfield University. The Centre provides horizon scanning and futures studies across the food and environment areas, to help us identify and address potential new threats and opportunities, to deliver safer food in the long-term. It provides us with access to expertise we do not have at the Agency, allowing us to share costs and to develop a common understanding of cross-cutting issues by working in partnership with other government departments.

Funding for the Centre started in April 2011 for an initial period of three years. Total funding over this time is £1.8 million, with the Agency contributing £150,000. Other partners include Defra, Marine Management Organisation, Scottish Government (covers SEPA and CAMERAS), Environment Agency, Natural England, Welsh Government and Department of Energy and Climate Change, with further interest from several other funders.

The Centre provides four work streams to:

- Develop a programme of regular environmental and food horizon scanning to identify and disseminate emerging issues on the short, medium and long term horizons.

- Develop and integrate risk analysis methods and techniques to assess and prioritise the importance/likelihood and impact of emerging issues identified. This will help ensure a more rigorous and evidence-based assessment and prioritisation of issues and allow Agency issues to be considered in a wider context.

- Develop a programme of larger scale futures studies, for example, scenario building, to investigate a range of plausible futures and their implications for high priority issues. This will allow our issues to be considered in a wider analysis of cross-cutting or shared issues and help develop common understanding with partner organisations. A large project on ‘Plausible futures scenarios for the UK food and feed system for 2015 and 2035’ started in 2011.

- Build wider capacity to assess future risks and opportunities, through a range of training courses and knowledge exchange activities and materials. This will help us develop Agency skills in this area and to embed futures/risk approaches in policy development and planning, recognising it is impractical to develop and support fully-fledged futures experts in-house.
There is also a share in a separate resource of ‘ad hoc’ time from futures experts at the Centre to work on smaller/more focused or specific pieces of work, such as: expert facilitation for workshops; input to scenario development and analysis on more specific topics; as well as the more cross-cutting work relevant to us and other partners.

The Centre produces a regular horizon scanning newsletter which covers new insights and emerging issues from a range of topic areas. It includes anything from shifts in consumer attitudes and developments in food and farming, to trends in technology, energy and resources.

7.2 Working across the EU on emerging risks

The importance of early identification of risks in the food chain is recognised in the European Food Safety Authority’s (EFSA) Founding Regulation. Cooperation and networking is essential in identifying, addressing and communicating emerging risks. Data monitoring and analysis are fundamental to the identification of emerging risks. The ability to filter signs from a diverse range of data is a key component of this activity, including trade and regulatory data [such as data from the Rapid Alert System for Food and Feed (RASFF) and the International Food Safety Authorities Network (INFOSAN)], the outputs of expert committees (including those of the European Commission), and the scientific literature, and we play an active part in this work.

We are working with EFSA’s Emerging Risks Unit (EMRISK) to identify actions to reduce food safety issues arising at source in third countries, and to develop methods for data collection and sharing emerging issues with EFSA and member states via the Emerging Risks’ Exchange Network. Exchange of information also includes the identification and sharing of methodologies for the detection of emerging risks.

EFSA has set up a data collection working group to develop systems to evaluate data and information sources. We have identified specific methodologies for assessing data sources and have made recommendations that the selection of such sources should include a ‘gap analysis’ to identify data types which are missing or under represented. We are using the principles of this work to assess and map data sources that have been identified, to identify and rank those that are most relevant to our Emerging Risks Programme.

7.3 The International Food Safety Authorities Network

The International Food Safety Authorities Network (INFOSAN) is a joint initiative between the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) and includes 177 member states. Each member state has a designated INFOSAN emergency contact point for communication between national food safety authorities and the INFOSAN
secretariat regarding urgent events, and focal points in other ministries or relevant agencies have been identified to receive INFOSAN communications.

7.4 Strategic challenge on food safety

The General Advisory Group on Science (GACS) established a Strategic Evidence Working Group in 2010 to consider the issues around strategic evidence and how GACS could contribute challenge and advice on these for the Agency. The Working Group concluded that our ‘business as usual’ evidence-gathering is well established, but it recommended there should be a focus on how to get a better understanding of what alternative or innovative approaches might look like, and how these might be implemented. GACS endorsed the ideas suggested in the report for how to develop this further and it highlighted support for an open research call, specifically to generate ideas we do not identify through our evidence prioritisation process, and for exploring the potential for placements to bring in new expertise and perspectives.

As a result we piloted a new approach to commissioning research in August 2011, to identify innovative approaches to address our strategic challenges. Our aim is to fund speculative, open-ended or long-term research that may require approaches that bring together several disciplines or funders. Following the research call we have funded four new short-term projects, see text box below. We will be looking to develop this challenge further in 2012.

Our strategic challenge

Projects to address the following topics were initiated in 2012:

- a new radio technique for detecting foreign objects, such as bone, in packaged or unpackaged food

- the development of a risk management tool, and testing the feasibility of adding a database to the Local Authority Enforcement Monitoring System to help improve the decision making process for sampling imported foods and the ability to perform rapid screening of foods for contaminants

- exploring the feasibility of extending existing models to allow calculation of the lethal effect associated with heat treatments of ‘sous-vide’ foods, which are cooked at relatively low temperatures, on the reduction of food pathogens compared to that of traditional cooking regimes

- a desk-based study to identify and review the potential of emerging molecular microbiology technologies in the management of foodborne disease outbreaks
7.5 Global food security

The UK's main public funders of food-related research and training are working together through the Global Food Security Programme to meet the challenge of providing the world's growing population with a sustainable, secure supply of good quality food from less land and with lower inputs.\(^\text{128}\)

The programme will deliver coordinated, multidisciplinary research through four themes:

- economic resilience
- resource efficiency
- sustainable production
- sustainable, healthy, safe diets

Each theme is led by a research council and a government department. The theme on sustainable, healthy, safe diets is led by us in conjunction with the Medical Research Council (MRC). The role of the theme leads is to help develop research priorities under the themes, and to ensure that all the appropriate partners are engaged. There is also co-ordination between the themes to promote a more holistic approach to the issues, recognising their interrelatedness.

The Global Food Security Programme provides a key forum to identify collaborative working opportunities and to facilitate a more coherent approach. A recent example of this collaborative approach is the public policy seminar on ‘Global Food Systems and UK Food Imports – Resilience, Safety and Security’\(^\text{129}\) held in March 2012, which we co-funded with the Economic and Social Research Council (ESRC), Defra and the Scottish Government under the economic resilience theme. The aim of the seminar was to discuss the issues surrounding the importation of food into the UK. The seminar encouraged the exchange of knowledge and ideas and provoked discussion regarding possible future research opportunities. The outputs from the seminar are currently undergoing further consideration. A report of the seminar will be published in 2012.

A significant proportion of our science- and evidence-gathering activity aligns with and supports the aims of the Global Food Security Programme, for instance our co-funded work on campylobacter. The programme has been an important driver to a meeting we are organising in June 2012 involving the key funders of research into the microbiological safety of food. This will explore opportunities that might exist for more collaborative working on campylobacter and other key foodborne disease organisms.

We will continue to provide input and support into the programme over the coming twelve months.
# Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACMSF</td>
<td>Advisory Committee on the Microbiological Safety of Food</td>
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<td>Article 36</td>
<td>A pre-qualified list of organisations that have applied for and been accepted as qualified to help support the scientific work of EFSA</td>
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<tr>
<td>BBP</td>
<td>Benzyl Butyl Phthalate</td>
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<td>BBSRC</td>
<td>Biotechnology and Biological Sciences Research Council</td>
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<td>Bq</td>
<td>Becquerel (measurement of radioactivity)</td>
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<tr>
<td>CAMERAS</td>
<td>Co-ordinated Agenda for Marine, Environment and Rural Affairs Science Boards</td>
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<td>CERF</td>
<td>Centre for Environmental Risk and Futures, Cranfield University</td>
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<td>CoPSAC</td>
<td>Code of Practice for Scientific Advisory Committees</td>
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<td>COT</td>
<td>Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment</td>
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<td>CPMS</td>
<td>Contract and Project Management System</td>
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<td>DBP</td>
<td>Di-n-Butyl Phthalate</td>
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<td>DCHP</td>
<td>Dicyclohexyl Phthalate</td>
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<tr>
<td>Defra</td>
<td>Department for Environment, Food and Rural Affairs</td>
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<td>DEHP</td>
<td>Di-(2-ethylhexyl) Phthalate</td>
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<td>DEP</td>
<td>Diethyl Phthalate</td>
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<td>DH</td>
<td>Department of Health</td>
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<td>DiBP</td>
<td>Di-isobutyl Phthalate</td>
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<td>DNSIYC</td>
<td>Diet and Nutrition Survey of Infants and Young Children</td>
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<td>DON</td>
<td>Deoxynivalenol</td>
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<td>EAACI</td>
<td>European Academy of Allergy and Clinical Immunology</td>
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<td>eFOSS</td>
<td>Electronic Foodborne and non-Foodborne Gastrointestinal Outbreak Surveillance System</td>
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<td>ePPS</td>
<td>Electronic Public Procurement System</td>
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<td>EFSA</td>
<td>European Food Safety Authority</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<td>EMRISK</td>
<td>EFSA’s Emerging Risks Unit</td>
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<td>EPA</td>
<td>United States Environmental Protection Agency</td>
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<td>ERC</td>
<td>European Research Council</td>
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<td>ESRC</td>
<td>Economic and Social Research Council</td>
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<td>EU</td>
<td>European Union</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FARRP</td>
<td>Food Allergy Research and Resource Programme</td>
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<td>FET</td>
<td>European Commission’s Future and Emerging Technologies Programme</td>
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<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
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<td>FHIS</td>
<td>Food Hygiene Information Scheme</td>
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<td>FHRS</td>
<td>Food Hygiene Rating Scheme</td>
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<td>FP7</td>
<td>The European Union Framework Programme on Research Technological Development and Demonstration (2007 to 2013)</td>
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<td>GACS</td>
<td>General Advisory Committee on Science</td>
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<td>HESI</td>
<td>Health and Environmental Sciences Institute</td>
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<td>HPA</td>
<td>Health Protection Agency</td>
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<td>HPS</td>
<td>Health Protection Scotland</td>
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<td>ICT</td>
<td>Information and Communications Technology</td>
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<td>IID</td>
<td>The Infectious Intestinal Disease in the Community Study</td>
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<td>ILSI</td>
<td>International Life Sciences Institute</td>
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<td>INFOSAN</td>
<td>International Food Safety Authorities Network</td>
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<td>JECFA</td>
<td>Joint FAO/WHO Expert Committee on Food Additives</td>
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<td>LCF</td>
<td>UK Living Costs and Food module of the Integrated Household Survey (formerly the Expenditure and Food Survey)</td>
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<td>MBP</td>
<td>Monobutyl Phthalate</td>
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<td>MEHP</td>
<td>Mono-(2-ethylhexyl) Phthalate</td>
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<td>MLST</td>
<td>MultiLocus Sequence Typing</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>MRC</td>
<td>Medical Research Council</td>
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<td>mSv</td>
<td>Millisieverts (measurement of radiation dosage)</td>
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<td>NDNS</td>
<td>National Diet and Nutrition Survey</td>
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<td>NGOs</td>
<td>Non-Governmental Organisations</td>
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<td>NIV</td>
<td>Nivalenol</td>
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<td>NMES</td>
<td>Non-Milk Extrinsic Sugars</td>
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<td>ObSurv</td>
<td>Health Protection Scotland’s Surveillance System</td>
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<td>OTA</td>
<td>Ochratoxin A</td>
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<td>PIFA</td>
<td>Prevalence of Infant Food Allergy study</td>
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<td>RASFF</td>
<td>Rapid Alert System for Food and Feed</td>
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<td>SAC</td>
<td>Scientific Advisory Committees</td>
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<td>SACN</td>
<td>Scientific Advisory Committee on Nutrition</td>
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<td>SEPA</td>
<td>Scottish Environment Protection Agency</td>
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<td>SRM</td>
<td>Specified Risk Material</td>
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<tr>
<td>TDI</td>
<td>Tolerable Daily Intake</td>
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<td>Transmissible Spongiform Encephalopathy</td>
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<td>UV</td>
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<td>VITAL</td>
<td>Integrated Monitoring and Control of Foodborne Viruses in European Food Supply Chains</td>
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