

**ANALYSIS OF RISKS ACROSS THE FOOD CHAIN**

**Executive Summary**

1. The Board requested an analysis of risks in terms of both public health and economic impact across points of the food chain (primary production; retail; catering; etc), to help ensure that resources and attention are focused in the most effective way.
2. This note sets out the proposed approach and what we will deliver by late 2008.
3. The Board are invited to:
  - **note** the proposed approach;
  - **note** the analysis that will be delivered by late 2008.

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## ANALYSIS OF RISK ACROSS THE FOOD CHAIN

### Issue

1. To report plans for analysis of risks across the food chain to increase understanding of the public health and economic impacts of food safety hazards, and to help ensure that resources and attention are focused where they will be most effective at controlling risk.

### Strategic Aims

2. To help ensure food safety in an effective and proportionate manner.

### Background

3. At the February 2008 Board meeting Andrew Wadge gave a progress report on food safety, including analysis to date by FSA on the public health and economic impacts of risks (reference FSA 08/02/07). The Board agreed that there was considerable merit in taking a "HACCP for the whole food chain" approach, and this paper sets out a methodology to meet the Boards request. The proposed approach is broadly based on the first two steps of HACCP, Hazards Analysis<sup>1</sup> and Identifying Controls<sup>2</sup>.
4. The approach intends to inform high level risk management decisions by considering whether resources and attention are focused in the most effective way to control risk. This will be achieved by assessing:
  - The public health and economic<sup>3</sup> impact of hazards<sup>4</sup> at points across the food chain (primary production; retail; catering; etc);
  - The extent to which resources and attention appear to be focused in the most cost effective way in minimising impacts; and
  - where there is an apparent mismatch between risks and resources, assess the impact of changes to controls and resources on risk.

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<sup>1</sup> Assessing the nature, impact and likelihood of food safety hazards at each point in the food chain.

<sup>2</sup> Identify controls to prevent, eliminate, or reduce a hazard to an acceptable level, establish impacts these will have on reducing hazard and the costs of controls.

<sup>3</sup> The economic impacts includes the cost of illness (direct costs e.g. NHS costs, lost earnings and the indirect costs associated with pain, grief and suffering) as well as costs to industry (e.g. cost of product recalls) from a breakdown in food safety where this can be estimated.

<sup>4</sup> This does not include risk from food fraud. The examination of food fraud risks across the food chain remains a separate piece of work.

5. Of course factors other than levels of risk will influence decisions on controls (eg. EU statutory official controls place constraints on what can be changed in the shorter term), but this analysis should provide an important part of the jigsaw in informing decision making in both the short and longer term. As such, findings from the first phase of the work (outlined in paragraph 15 below) will be fed into discussions on the strategic direction setting as part of the 2010-2015 strategic plan development at the November Board retreat.
6. In addition to supporting decision making on the future allocation of resources and controls, this work has links with a number of other stream of work across the Agency. Including the 'blank sheet of paper' analysis of the regulatory regime for meat and the review of the current strategic plan. Links with such projects will be developed and maintained to ensure they are able to build on the findings from the analysis of risk across the food chain.

### **Existing Work**

7. The approach proposed here seeks to build on existing evidence and knowledge from across the FSA. Analysis and Research Division have undertaken analysis of public health and economic costs of illness from various food hazards. Policy teams also undertake considerable work to prioritise their effort and resources to manage risks within their own areas of responsibility. This is frequently targeted at addressing a specific food-hazard combination (e.g. campylobacter in chickens) or at a specific point in the food chain (e.g. slaughters house hygiene) rather than across the food chain.
8. Our proposed approach, which combines a top down analysis of risks for the whole food chain, and a bottom up analysis of risks at points in the food chain, is summarised below. A more detailed description of the proposed approach is given in Annex 2. A number of similar and complementary projects are underway in other organisations (details at Annex 1), and we will continue to research these approaches and refined our methodology in the light of findings.

### **Proposed approach**

#### **Top down analysis**

9. "Top down" analysis will be undertaken that sets out evidence on the public health and economic impacts of food safety hazards for the food chain overall, and where possible for relevant points in the food chain (Annex 3 gives a template for this). This will provide a framework to assess relative risks for each food safety hazard.
10. In addition, for the main steps in the food chain we will set out the controls and resources in place to mitigate food safety risks (example in Annex 4).

11. This top down analysis will provide an overview of risks, and will also show the resources devoted to controlling food safety hazards for the main points in the food chain. It is anticipated that there will be some knowledge and data gaps (e.g. the long term public health risks from chemical contamination; some industry costs), and these will be highlighted<sup>[0]</sup> along with any caveats and uncertainties with estimates. Conclusions will be drawn, as far as is possible at this stage, on the allocation of resources to risks, both in terms of proportionality and prioritisation of resource allocation.

#### Bottom up food chain analysis

12. A “bottom up” analysis by broad food group (red meat, dairy etc.) is proposed to give a comprehensive picture of the risks and resources at each point of the food chain. This more detailed approach is necessary since hazards and risk vary considerably by food group, and the more detailed analysis is therefore required in order to provide estimates of risk for each point in the food chain.

13. For each food group, a high level map of the food chain will be developed (Annex 5 shows what this might look like), and it will be populated with available evidence on risks. Where necessary surrogate measures (ie microbes; chemicals; etc) will be used for the public health risks, and these will show the relative levels of risk that occur across the food chain. Expert elicitation and interpolation of risks may be necessary where risk data is not available for some points in the food chain. The current controls and associated resources will also be set out for each step in the food chain, and comparisons made with levels of risk.

14. However, a simplistic comparison of resources with current risks could be misleading, firstly because risks may be low due to the existing controls in place and altering these may increase the level of risk, and secondly the appropriateness of controls depends not only on the level of risks posed, but also on the existence and cost effectiveness of alternative control mechanisms. Hence, where there is an apparent mismatch between levels of risk and resources, further analysis is required to establish the likely impact of changing controls on the levels of risk. In this situation sensitivity analysis will be carried out to assess the marginal change in risk given a marginal change in controls/resources.

15. Where appropriate country specific analysis of risks and resources will be undertaken.

#### Work Programme

16. The following analysis will be carried out and reported to the Board by late 2008:

- undertake further research into approaches under development in other organisations, and refine our methodology as appropriate;

- "top down" analysis of risks and controls for the food chain overall, and where possible for points across the food chain;
- "bottom up" food chain analysis for the red meat food group (ruminants);
- due to the current focus on the cost effectiveness of the MHS it is proposed that, as part of the red meat food chain analysis, sensitivity analysis be carried out for abattoirs and cutting plants, in order to assess the likely impact on risks from changes to controls.

**Board Action required**

17. The Board are invited to:

- **note** the proposed approach;
- **note** the analysis that will be delivered by late 2008.

## Similar Initiatives in other Organisations

**United States:** In the US, the FDA's Food Protection Plan published in November 2007<sup>5</sup>, highlights the following cross-cutting principles which are in line with the boards aspirations:

1. *Focus on risks over a product's life cycle from production to consumption.*
2. *Target resources to achieve maximum risk reduction.*

The FDA are working with a range of organisations (such as the Food Safety Research Consortium (FSRC)<sup>6</sup> and Joint Institute for Food Safety and Applied Nutrition (JIFSAN)<sup>7</sup>) to develop a 'science-based process/framework for prioritising potential risk from microbial and chemical contaminants in food' and 'Examining all aspects of the product life cycle helps define the areas of greatest risk.'

**UK:** The RELU-Risk<sup>8</sup> project seeks to bring together natural science modelling of risks and uncertainties in the food chain with social science approaches to understanding consumer behaviours, risk communication and participatory processes. To ensure that full account is taken of a wide range of potential social, economic and political impacts as well as the more immediate public health related and safety issues in food safety risk management decisions.

**Europe:** MET-VET-NET<sup>9</sup> are considering methods and collecting data to support prioritisation of foodborne and zoonotic pathogens at the EU level, although they do not extend this to cover other food safety risks.

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<sup>5</sup> <http://www.fda.gov/oc/initiatives/advance/food/plan.pdf>

<sup>6</sup> The FSRC is a multi-disciplinary collaboration of several institutes from the United States with the aim to improve public health. For more details see the website: [www.rff.org/fsrc/](http://www.rff.org/fsrc/).

<sup>7</sup> In the US JIFSAN provide the scientific basis for ensuring a safe, wholesome food supply as well as provide the infrastructure for contributions to national food safety programs and international food standards.

<sup>8</sup> RELU-Risk is a multidisciplinary project which brings together natural science modelling of risks and uncertainties in the food chain with social science approaches to understanding consumer behaviours, risk communication and participatory processes.

<http://www.relu.ac.uk/research/projects/Shepherd.htm>

<sup>9</sup> MED-VET-NET is a European network of excellence, working for the prevention and control of Zoonoses and food borne diseases. Details of WP 23 can be found at <http://www.medvetnet.org/cms/templates/doc.php?id=69>

## Proposed approach for analysis of risks across the food chain

1. The Board requested an analysis of risks in terms of both public health and economic impact across points of the food chain (primary production; retail; catering; etc) to ensure that resources and attention are focused in the most effective way. The approach proposed here seeks to build on existing evidence and knowledge from across the FSA, and learn from experience of others in developing a methodology to assess risk across food chains and inform decision making.

### Top down analysis

2. The proposed approach is to first carry out a “top down” analysis that sets out evidence on the public health and economic impacts of food safety hazards for the food chain overall, and where possible for relevant points in the food chain (Annex 2 show what this will look like). This will provide a framework to assess relative risks by source of risk. Some sources of risk are difficult to quantify such as the long term public health effects of chemical contamination. We will set out sources of data and estimates along with caveats and uncertainties with estimates, and highlight data gaps where estimates can not be made at this point in time.
3. In addition, for the main steps in the food chain we will set out the main controls and resources in place to mitigate food safety risks (Annex 3 show what this might look like). These will be split, as far as possible, by source of risk, and where possible links will then be drawn between resources and associated risks at each point in the food chain
4. This top down analysis will provide an overview of risks, and where possible the points in the food chain that they occur. It will also give an overview of resources across food chains that are devoted to tackling food safety risk. Conclusions will be drawn, as far as is possible at this stage, on the allocation of resources to risks, both in terms of proportionality and prioritisation of resource allocation.

### Bottom up food chain analysis

5. A “bottom up” analysis by broad food group (eg. red meat; dairy etc - Annex D provides an example of what this might look like) is also proposed to understand risks and resources at each point of the food chain. This more detailed approach is necessary since risks vary considerable by food group, and it is therefore necessary in order to produce meaningful estimates of risks for each point in the food chain.

6. We will seek to analyse food groups that account for the majority of food safety risks and the resources devoted to tackling these, rather than a complete coverage of all foods.
7. For each food group, this analysis will involve:

Estimating risks at each point in the food chain:

- Developing a high level map of the food chain specific to the food group under consideration;
- Populating the map with available evidence on the level of risks for all hazards that apply for this food group. Where health impacts are known these are generally for the overall food chain and not for particular steps in that chain. Food chain analysis will therefore need to focus on surrogate measures of risk (ie. levels of microbes; chemicals; etc) and these will show the relative levels of risk that occur across the food chain. Extrapolation from surrogate measures to the associated health risks and economic costs will be made as far as is possible.
- Expert elicitation and interpolation of risks may be necessary where risk data is not available for some of the steps in the food chain.

Understanding impact of control measures and resources

- For each step in the food chain set out current controls and associated resources that are focused on eliminating/reducing the level of risk for each hazard. Much of this information will be available from the top down analysis, and this will be supplemented with additional information from the more detailed food group analysis as appropriate;
- Current levels of risk are the residual risks that remain given the level of controls currently in place. This means that simplistic mapping of resources to current risks could be misleading, firstly because risks may be low due to controls and a reduction in those controls may increase the risk, and secondly, the appropriate level of controls depends both on the level of risks posed, and on the scope for, and cost effectiveness of, additional controls. Sensitivity analysis on the marginal change in risk given a marginal change in resources is therefore required to increase understanding of the impact of changes to controls.
- Sensitivity analysis on the marginal change in risk given a marginal change in controls/resources will be carried out for points in the food chain where there is an apparent mismatch between levels of risk and resources. And, given the current focus on the cost effectiveness of the MHS, it is proposed that this type of sensitivity analysis be carried out for abattoirs and cutting plants.

8. These two approaches complement each other and combined will provide for a better understanding of risk and the impact of controls by hazard, by food group and by point in the food chain. This food chain analysis should allow consideration of:
  - The relative contribution to risk of each point in the food chain.
  - Within food groups, the extent to which controls appear targeted at the most effective steps in the food chain and are proportionate to the risks posed;
  - The relative risks across food groups, and the extent to which controls and resources appear targeted where they will have greatest impact;
  - The scope for changing controls where there is an apparent mismatch between risk and resources.
9. Where appropriate country specific analysis of risks and resources will be undertaken.