

MAY 05 WORKING DRAFT

GUIDE TO FOOD SAFETY AND OTHER REGULATIONS FOR THE MEAT INDUSTRY

FOREWORD

This Guide is relevant to those UK food businesses that slaughter animals for human consumption or cut or process meat and associated products (see table), particularly those establishments that are subject to approval and, in the case of slaughterhouses, cutting plants and combined premises, veterinary control. Its aim is to guide both industry and government users through the legislation and achieve a widely agreed view of good practice.

OPERATIONS COVERED IN THE GUIDE
Red Meat Slaughter (domestic ungulates e.g. <i>cattle, sheep, pigs, horses</i>)
White Meat Slaughter (i.e. poultry and lagomorphs - <i>rabbits, hares, rodents</i>)
Approved Farm Slaughter (i.e. poultry and lagomorphs)
Farmed Game Handling (Large: deer, bison, ratites – <i>ostriches</i> ; Small: game birds and rabbits)
Wild Game Handling (Large: wild deer, boar; Small: game birds, rabbits and hares)
Cutting of red, white or game meat
Production of Meat Products, Mince Meat, Meat Preparations and Mechanically Separated Meat (MSM)
Edible By-Products (i.e. rendered animal fats & greaves, treated stomachs, bladders & intestines, gelatine, collagen) but note that product-specific requirements are set out in a separate guide (see Chapter 3)

From 1 January 2006 new food hygiene regulations apply in all EU Member States. The legislation emphasises every food business operators' responsibility to produce food safely. Although some specific slaughter and meat handling requirements remain, these regulations replace many prescriptive requirements of previous meat hygiene laws with obligations placed on all food businesses to apply good hygienic practices and food safety management procedures based on hazard analysis and critical control point (HACCP) principles.

The legislation includes the idea of voluntary industry guides to good practice, which Competent Authorities (the FSA in the UK) should help to develop. Such guides have been used in other food sectors, but until now the meat sector's only official guidance were the references to operator's duties in the Operations Manuals of the enforcement bodies¹. These manuals have been revised to reflect the new legislation and no longer include information about operator's duties. The Agency has therefore worked with representatives of the meat industry and enforcement bodies to produce a single guide to the legislation to which operators, enforcement officers and policy makers may refer.

The Agency would like to thank everyone involved in producing this document and invites any user to submit suggested amendments to the Industry Guide Editor, Meat Hygiene & Veterinary Division, FSA, 125 Kingsway, London WC2B 6NH.

The Editor
[Date of Issue]

¹ The Meat Hygiene Services (MHS) in England, Scotland and Wales and the Department of Agriculture and Rural Development in Northern Ireland (DARDNI)

FOREWORD

1. CONTENTS [NB Only ticked ✓ items included in this consultation]

PART ONE

1. **Contents** ✓
2. **Amendment Record** ✓
3. **Introduction to the Regulations** ✓
4. **How to Use the Guide** ✓
5. **General Obligations for Operators & Official Controls** ✓
6. **Hazards in Meat Production** ✓
7. *Approval Procedures*

PART TWO

1. **Design & Facilities** ✓
2. **Water Supply** ✓
3. **Maintenance** ✓
4. **Cleaning** ✓
5. **Pest Control** ✓
6. **Training** ✓
7. **Personal Hygiene** ✓
8. **Raw Materials including live animals** [first draft] ✓
9. *Hygienic Production*
10. *Waste management [link with By-products/SRM]*
11. **Traceability, Identification and Health Marking** ✓
12. **Wrapping & Packaging** ✓
13. *Temperature Controls*
14. **Transport Hygiene** ✓

PART THREE

1. *HACCP [EC guidance to be finalised]*
2. *Microbiological Testing [legislation to be finalised]*

PART FOUR [Information on current legislation may be added]

1. *SRM*
2. *Animal By-Products*
3. *BSE/TSE Testing*
4. *Cattle Identification*
5. *Animal Welfare*
6. *Notifiable Disease*

PART FIVE

1. **Definitions & glossary** ✓
2. *Index [to be added before publication]*

2. AMENDMENT RECORD

- 2.1 This Guide will be updated when necessary, in consultation with a panel of stakeholders. For example, when advice on best practice, government policy or legislation changes. Serially numbered amendments will be issued with an updated copy of this page.
- 2.2 Guide holders should confirm the insertion of new page(s) on the amendment sheet below.

	Amendment	√
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16.		
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44.		
46.		
48.		
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3. INTRODUCTION TO THE REGULATIONS

This Guide sets out the legal obligations that apply to food business operators in the meat sector and also provides advice on how these obligations may be met.

Compliance with the law is not voluntary but operators are not obliged to use the guide as other ways of achieving compliance may be equally valid. The guide is not an authoritative interpretation of the law as only the courts have that power.

FOOD HYGIENE REGULATIONS

3.1 The Food Hygiene Regulations agreed in 2004 apply in all Member States from 1 January 2006. They replace 17 directives, including eight relating specifically to meat. These regulations are²:

- **Regulation 852/2004** - Hygiene of Foodstuffs³.
- **Regulation 853/2004** - Specific Hygiene Requirements for Food of Animal Origin⁴.
- **Regulation 854/2004** - Organisation of Official Controls on Products of Animal Origin intended for human consumption⁵.

[A further regulation made in 2005 also applies, which in some cases delays the date on which specific requirements take effect:

- **Regulation xxx/2005** - Implementing and Transitional Measures⁶]

Regulation 852/2004 - Hygiene of Foodstuffs

3.2 Regulation 852/2004 sets out general hygiene rules that apply to all food businesses, including structural requirements and the implementation of permanent procedures based on hazard analysis and critical control point (HACCP) principles. The implementation of HACCP-based procedures and 'pre-requisite' hygiene requirement together form the operator's 'food safety control system'. The Regulation sets out the objectives for 'good hygienic practices' to be achieved to protect consumers. The Guide aims to provide risk-based, proportionate advice on the facilities and procedures that can meet those objectives. For example, providing advice on how hygienic separation of certain operations could take place in time rather than space. The Guide also provides advice on the application of HACCP principles in meat plants.

² View EU legal texts on this website: http://europa.eu.int/eur-lex/en/search/search_lif.html

³ Regulation EC No. 852/2004 published in the Official Journal L226 on 25.6.2004, pages 3-21

⁴ Regulation EC No. 853/2004 published in the Official Journal L226 on 25.6.2004, pages 22-82

⁵ Regulation EC No. 854/2004 (OJ L191, 28.5.2004) as amended by Regulation 882/2004 published in the Official Journal L226 on 25.6.2004, pages 83-127.

⁶ Regulation EC No. xxx/2005 published in the Official Journal L[] on [], pages []

Regulation 853/2004 - Specific Hygiene Requirements for Food of Animal Origin

3.3 Regulation 853/2004 includes additional requirements for meat production. The Guide provides advice on meeting the meat-specific requirements for:

- Slaughter and cutting of meat of domestic ungulates (*Section I*)
- Slaughter and cutting of meat from poultry & lagomorphs (*Section II*)
- Meat of Farmed Game (*Section III*)
- Wild Game Meat (*Sections IV*)
- Minced Meat, Meat Preparations & MSM (*Section V*)
- Meat Products (*Section VI*)

Separate guidance on the following products is available from: []

- Rendered Animal Fats & Greaves (*Section XII*)
- Treated Stomachs, Bladders & Intestines (*Section XIII*)
- Gelatine (*Section XIV*)
- Collagen (*Section XV*)

Regulation 854/2004 - Official Controls on Products of Animal Origin

3.4 Regulation 854/2004 includes the specific requirements for inspection and auditing duties of official veterinarians (OVs) and official auxiliaries (meat inspectors in UK). The MHS and DARD Manuals for Official Controls contain operational instructions for staff, including the task of auditing of HACCP and good hygiene practices to verify that food business operators apply procedures 'continuously and properly'⁷. Officials may use the Guide when auditing an operator's compliance with food hygiene and the other legislation that it covers, but should always refer back to the original legislation.

[Regulation xxx/2005 - Implementing and Transitional Measures]

3.5 []

OTHER LEGISLATION

3.6 The Guide also sets out the meat plant operator's obligations under Regulation 178/2002 (General Food Law) where appropriate, under Regulation [xxx/2005] on Microbiological Criteria (Part Three)[, and under other public health, animal health and welfare legislation referred to in the food hygiene regulations (Part Four)].

⁷ Regulation 854/2004 Article 4 points 2, 3, 4 and 5

4. HOW TO USE THE GUIDE?

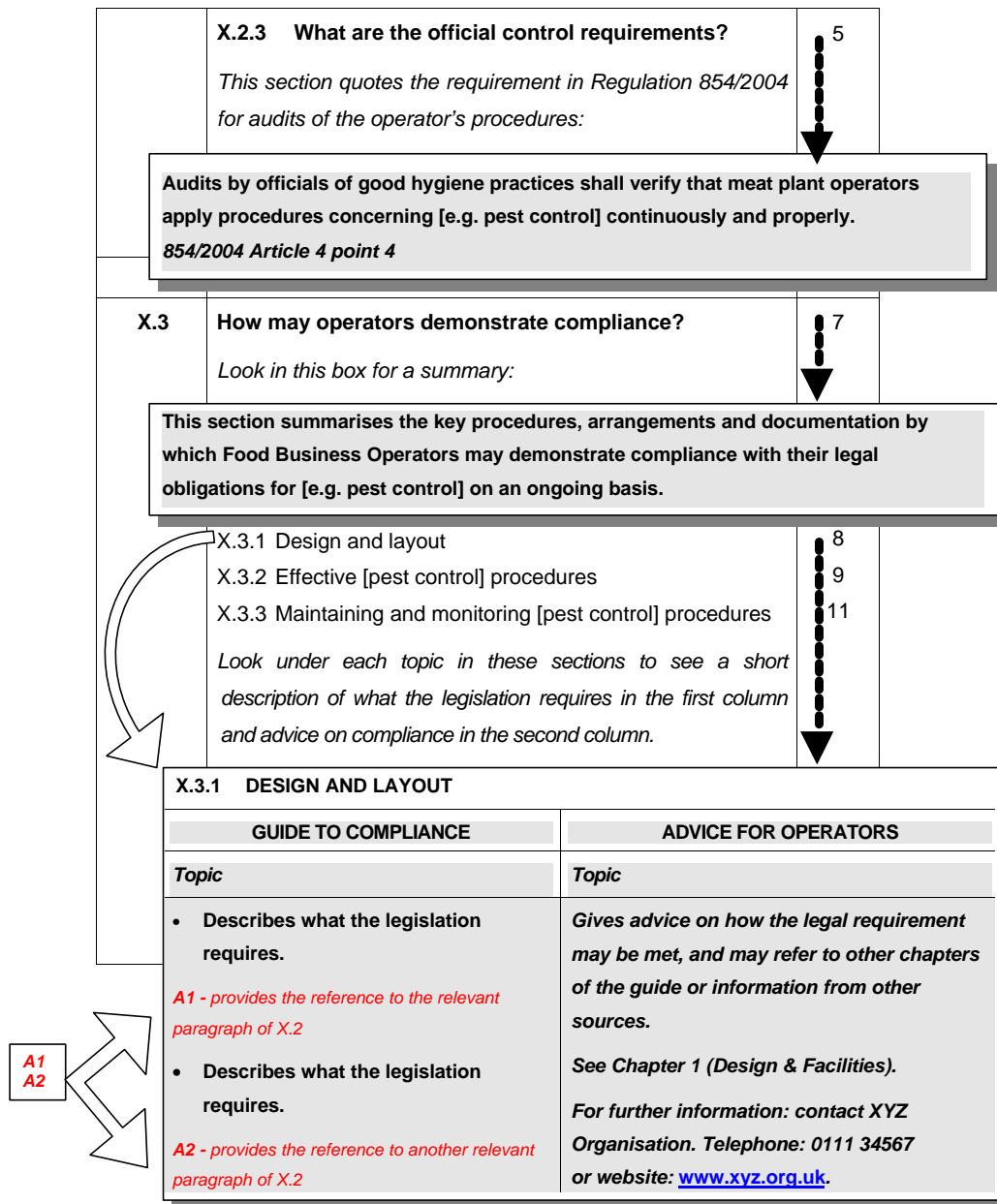
4.1 Each chapter in Parts Two, [Three and Four] of this Guide are set out in this way:

Section		Page																
	Contents	1																
X.1	Why is [e.g. pest control] important?	2																
X.2	What are the legal requirements for [pest control]?																	
	<p>X.2.1 Which operations does the law apply to?</p> <p>Check the table on page 3 to see which sections of the following legal texts might apply to your meat operation.</p> <table><thead><tr><th>Operations</th><th>Relevant section of X.2.2</th></tr></thead><tbody><tr><td>Red Meat Slaughter</td><td>A, B</td></tr><tr><td>White Meat Slaughter</td><td>A, B</td></tr><tr><td>Approved Farm Slaughter</td><td>A</td></tr><tr><td>Farmed Game Handling</td><td>A, B</td></tr><tr><td>Wild Game Handling</td><td>A, C</td></tr><tr><td>Meat Cutting and Production of Meat Products, Mince Meat, Meat Preparations and MSM</td><td>A, C</td></tr><tr><td>Edible By Products</td><td>A, C</td></tr></tbody></table>	Operations	Relevant section of X.2.2	Red Meat Slaughter	A, B	White Meat Slaughter	A, B	Approved Farm Slaughter	A	Farmed Game Handling	A, B	Wild Game Handling	A, C	Meat Cutting and Production of Meat Products, Mince Meat, Meat Preparations and MSM	A, C	Edible By Products	A, C	3
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Edible By Products	A, C																	
	<p>X.2.2 What are the operator's legal obligations?</p> <p>A. Section of legislation</p> <p>B. Section of legislation</p> <p>C. Section of legislation</p> <p>Note that each section sets out the legal text and the regulations it has come from. Each paragraph has a number (e.g. A1) that is used in the 'guide to compliance' column later on in the Guide.</p>	3																
<p>A. GENERAL PROVISIONS</p> <p>1. Hazardous and/or inedible substances, including animal feed, are to be adequately labelled and stored in separate and secure containers.</p> <p>852/2004 Annex II Chapter IX Foodstuffs: point 8</p> <p>2. Food business operators must, ... have in place systems and procedures to identify food business operators from whom they have received ... products of animal origin.</p> <p>853/2004 Annex II Section I Identification Mark: point 4</p>																		

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5. GENERAL OBLIGATIONS OF OPERATORS & OFFICIAL CONTROLS

- 5.1 The safe production of food is a fundamental legal obligation of the food business operator and Competent Authorities have a duty to undertake official controls. Both of these obligations are outlined below with relevant definitions, at A and B, respectively.
- 5.2 Operators are expected to apply good hygiene practices and food safety management procedures to control food safety hazards (see Chapter 6). These procedures should cover:
- Adequate training and/or instruction of staff;
 - Working instructions for staff, including what to do in the case of foreseeable disruptions to normal working, such as breakdowns or contamination incidents;
 - Periodic monitoring to check that working instructions are being followed continuously and properly;
 - Corrective actions to restore control if food safety management procedures fail; including dealing with any contaminated product; establishing the underlying cause of a failure; preventing similar incidents in the future;
 - Confirming (verifying) that company procedures meet legal requirements:
- 5.3 The Guide makes suggestions on training, monitoring and maintaining procedures.

A. FOOD BUSINESS OPERATOR'S OBLIGATIONS

- **'Food business'** means any undertaking whether for profit or not and whether public or private, carrying out any of the activities related to any stage of production, processing and distribution of food.
- **'Stages of production, processing and distribution'** means any stage, including import, from and including the primary production of a food, up to and including its storage, transport, sale or supply to the final consumer and, where relevant, the importation, production, manufacture, storage, transport, distribution, sale and supply of feed.
- **'Food hygiene'**, hereinafter called 'hygiene', means the measures and conditions necessary to control hazards and to ensure fitness for human consumption of a foodstuff taking into account its intended use.
- **'Verification'** means checking by examination and the consideration of objective evidence whether specified requirements have been fulfilled.

1. Food ... business operators at all stages of production, processing, and distribution within the businesses under their control shall ensure that foods or feeds satisfy the

requirements of food law which are relevant to their activities and shall verify that such requirements are met.

178/2002 Article 17

2. This Regulation [852/2004] lays down general rules for food business operators on the hygiene of foodstuffs, taking particular account of the following principles:
 - (a) primary responsibility for food safety rests with the food business operators;
 - (d) general implementation of procedures based on the HACCP principles, together with the application of good hygiene practice, should reinforce food business operators' responsibility.

852/2004 Article 1

3. Food business operators shall ensure that all stages of production, processing and distribution of food under their control satisfy the relevant hygiene requirements laid down in Regulation 852/2004.

852/2004 Article 3

4. Food business operators carrying out any stage of production, processing and distribution of food after [primary production] shall comply with the general hygiene requirements laid down in Annex II [of Regulation 852/2004] and any specific requirements provided for in Regulation 853/2004.

852/2004 Article 4 point 2

5. Food business operators may use the National/Community guides as an aid to compliance with their obligations under this Regulation.

852/2004 Article 4 point 6

6. Food business operators shall put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles.

852/2004 Article 5 point 1

7. Food business operators shall comply with the relevant provisions of Annexes II [Identification marking, Objectives of HACCP procedures, Food Chain Information] and III [Specific Requirements relating to Meat].

853/2004 Article 3 point 1

B. OFFICIAL CONTROL REQUIREMENTS

- **'Audit'** means a systematic and independent examination to determine whether activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.
- **'Inspection'** means the examination of establishments, animals and food, of their processing, of food businesses, of their management and production systems, including finished product testing and feeding practices, and of the origin and destination of production inputs and outputs, in order to verify that all these items conform to legal requirements.
- **'Official control'** means any form of control that the competent authority performs for the verification of compliance with feed and food law, animal health and animal welfare rules.
- **'Verification'** means checking by examination and the consideration of objective evidence whether specified requirements have been fulfilled.

1. Member States shall ensure that food business operators offer all assistance needed to ensure that official controls carried out by the competent authority can be performed effectively. They shall in particular:
 - a. Give access to all buildings, premises installations or other infrastructures;
 - b. Make available any documentation and record required under the present regulation or considered necessary by the competent authority for judging the situation.
2. The competent authority shall carry out official controls to verify food business operators' compliance with the requirements of:
 - (a) Regulation (EC) No 852/2004;
 - (b) Regulation (EC) No 853/2004; and
 - (c) Regulation (EC) No 1774/2002.
3. The official controls referred to in paragraph 1 shall include:
 - (a) audits of good hygiene practices and hazard analysis and critical control point (HACCP)-based procedures;
 - (b) the official controls specified in Articles 5 to 8; and
 - (c) any particular auditing tasks specified in the Annexes.
4. Audits of good hygiene practices shall verify that food business operators apply procedures continuously and properly concerning at least:
 - (a) checks on food-chain information;
 - (b) the design and maintenance of premises and equipment;
 - (c) pre-operational, operational and post-operational hygiene;

- (d) personal hygiene;
- (e) training in hygiene and in work procedures;
- (f) pest control;
- (g) water quality;
- (h) temperature control; and
- (i) controls on food entering and leaving the establishment and any accompanying documentation.

5. Audits of HACCP-based procedures shall verify that food business operators apply such procedures continuously and properly, having particular regard to ensuring that the procedures provide the guarantees specified in Section II of Annex II to Regulation (EC) No 853/2004. They shall, in particular, determine whether the procedures guarantee, to the extent possible, that products of animal origin:
- (a) comply with microbiological criteria laid down under Community legislation;
 - (b) comply with Community legislation on residues, contaminants and prohibited substances; and
 - (c) do not contain physical hazards, such as foreign bodies.

When, in accordance with Article 5 of Regulation 852/2004, a food business operator uses procedures set out in guides to the application of HACCP principles rather than establishing its own specific procedures, the audit shall cover the correct use of these guides.

6. Verification of compliance with the requirements of Regulation 853/2004 concerning the application of identification marks shall take place in all establishments approved in accordance with that Regulation, in addition to verification of compliance with other traceability requirements.
7. In the case of slaughterhouses, game handling establishments and cutting plants placing fresh meat on the market, an official veterinarian shall carry out the auditing tasks referred to in paragraphs 3 and 4.
8. When carrying out auditing tasks, the competent authority shall take special care:
- (a) to determine whether staff and staff activities in the establishment at all stages of the production process comply with the relevant requirements of the Regulations referred to in paragraph 1(a) and (b). To support the audit, the competent authority may carry out performance tests, in order to ascertain that staff performance meets

specified parameters;

(b) to verify the food business operator's relevant records;

(c) to take samples for laboratory analysis whenever necessary; and

(d) to document elements taken into account and the findings of the audit.

9. The nature and intensity of auditing tasks in respect of individual establishments shall depend upon the assessed risk. To this end, the competent authority shall regularly assess:

(a) public and, where appropriate, animal health risks;

(b) in the case of slaughterhouses, animal welfare aspects;

(c) the type and throughput of the processes carried out; and

(d) the food business operator's past record as regards compliance with food law.

854/2004 Article 4 point 1

6. HAZARDS IN MEAT PRODUCTION

- A hazard is 'a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect'. (*Codex Alimentarius*)

6.1 Hazards may be introduced, increased, or controlled at each step in meat handling operations. Establishing what those hazards are in a business, is a key step in the HACCP (Hazard Analysis and Critical Control Point) process.

Biological Hazards/ Bacteria

6.2 The main hazards that can occur in meat are harmful food poisoning bacteria (like *E.coli* O157, Salmonella and Campylobacter). These harmful bacteria live in the guts of healthy animals, are shed in their faeces and can be carried on the hide, fleece, feathers or skin. The risks from these hazards are that:

- Food-poisoning bacteria can be transferred to meat/offal during dressing;
- Food-poisoning bacteria from e.g. worker's hands, tools, working surfaces, equipment, water, pests, cleaning equipment, packaging or other meat/offal, can be transferred on to raw meat/offal and ready-to-eat product;
- Food-poisoning bacteria on meat/offal can grow during production, storage or transport if the conditions, particularly temperature, are suitable.

6.3 Although thorough cooking kills most food poisoning bacteria, meat may be handled many times before it is cooked and the bacteria on it may be spread to other foods that may not be cooked before being eaten. When conditions are ideal, certain types of bacteria can double their numbers every 20 to 30 minutes. The number of bacteria needed to cause illness in a healthy adult may vary from 1,000,000 to as low as 10 (*E.coli* O157), depending on the organism. Food business operators and consumers need to take precautions that include maintaining temperature controls and keeping raw meat separate from cooked meat and other ready to eat foods. **For more information on bacterial organisms see the tables below.**

Biological Hazards/ BSE

6.4 A potential source of the BSE prion hazard that can cause vCJD is specified risk material (SRM) from an animal that is carrying the disease. The risks from the hazard are that;

- SRM is not correctly or completely removed from the carcass so consumers could potentially be exposed to BSE infectivity.
- Cross contamination of other carcasses occurs during SRM removal
- SRM is not correctly disposed of and may be diverted for food use.

Chemical Hazards

- 6.5 Possible sources of chemical contamination of animals include residues of veterinary medicines or pesticides if conditions of use have not been followed. Possible sources of chemical cross-contamination of meat/offal during processing, storage or transport include contact with cleaning and disinfecting agents, lubricants, or pest baits used in the meat plant or from a reaction between packaging material and the product.

Physical Hazards - 'foreign bodies'

- 6.6 Possible sources of physical hazards that may occur in animals include material such as metal or string that has been eaten or broken needles from veterinary treatment. Possible sources of physical contamination during meat production include metal from rails, clips, tags, machinery; knife blades, grease, oil, paint flakes, rust, plastic; rubber bands, jewellery; pens; buttons, hair, glass splinters; bone splinters; wood splinters; sawdust; dust and dead insects, animal droppings.

Conditions of Food/ Allergens

- 6.7 Some people have an allergy to meat but 90% of allergic reactions to food in the UK are caused by eight of the twelve foods covered by the requirements for labelling⁸ namely: milk, eggs, peanuts, nuts, fish, shellfish, soyabeans, cereals, celery, mustard, sesame seed and sulphur dioxide.

⁸ Food Labelling (Amendment) (No.2) Regulations 2004 implementing Directive 2003/89/EC

BACTERIAL CAUSES OF FOODBORNE INFECTION (In alphabetical order – see further details below)

AGENT	NORMAL INCUBATION PERIOD	NORMAL DURATION	MAIN CLINICAL SYMPTOMS	COMMONLY ASSOCIATED FOODS
1. <i>Campylobacter</i> spp.	3 - 5 days	2-7 days	Abdominal pain, diarrhoea (sometimes bloody), headache, fever	Poultry, cooked meats, milk
2. <i>Clostridium botulinum</i>	12 - 36 hours	Extended	Swallowing difficulties, respiratory failure	Preserved foods, e.g. canned, bottled
3. <i>Clostridium perfringens</i>	10 - 12 hours	24 hours	Abdominal pain, diarrhoea	Stews, roasts
4. <i>E.coli</i> O157	12 hours - 10 days	Possibly extended	Abdominal pain, diarrhoea (sometimes bloody). May lead to kidney failure	Beefburgers, meat, dairy products
5. <i>Listeria monocytogenes</i>	3 - 21+ days	Varies	Fever, headaches, spontaneous abortion, meningitis	Soft cheeses, patés, poultry meat
6. <i>Salmonella</i> spp.	12 - 36 hours	2-20 days	Abdominal pain, diarrhoea, fever, nausea	Meat, poultry, eggs, dairy products
7. <i>Staphylococcus aureus</i>	2 - 6 hours	12-24 hours	Vomiting, abdominal pain, diarrhoea	Cooked meat, human source
8. <i>Yersinia enterocolitica</i>	3 - 7 days	1-3 weeks	Acute diarrhoea, abdominal pain, fever and vomiting	Pig meat products

See also the Health Protection Agency website: www.hpa.org.uk/infections/topics_az/list.htm

<p>1. <i>Campylobacter</i> spp</p> <p>The likely cause of many cases of 'travellers' diarrhoea. In addition to the foods listed above, pigs, cattle, sheep, birds, dogs, cats and other pets can be reservoirs of infection. It can survive vacuum packing but is destroyed by thorough cooking. Temperature range for growth is 28-45°C all species grow at 37°C but they do not grow below 28°C. Will persist in chill and frozen conditions.</p>
<p>2. <i>Clostridium botulinum</i></p> <p>This organism is found in the soil and aquatic environments as well as the intestinal tract of animals and fish. Food poisoning occurs when the spores of <i>Clostridium botulinum</i> have germinated in a foodstuff and the bacteria then grow and produce toxin that is consumed when food is eaten. The spores are very heat resistant so a temperature of 121°C for three minutes is required to destroy them. Outbreaks have involved inadequately cooked canned products, or damaged cans. Inadequately processed low-acid foods and vacuum-packed products have been implicated. Temperature range for growth is about 3°-50°C, with an optimum between 20°-30°C.</p>

<p>3. <i>Clostridium perfringens</i></p> <p>Found everywhere in the environment: in soil, the gut of man and animals. These organisms form spores which are resistant to heat. They can be transmitted by eating contaminated food, usually stews, curries, gravies that have not been properly heated or re-heated. Spores are very likely to revert to live, vegetative bacteria and multiply during slow cooking and re-heating. Temperature range for growth is about 20°-50°C, with an optimum between 37°- 45°C.</p>
<p>4. <i>Escherichia coli</i> (Enterohaemorrhagic <i>E. coli</i> O157)</p> <p>There are several strains of <i>E.coli</i> classified by groups. The group causing the symptoms described consists of the haemorrhagic strains of <i>E.coli</i>. Many produce a toxin called a verocytotoxin and these are known as VTEC, the most common being <i>E.coli</i> O157:H7. Enterohaemorrhagic <i>E.coli</i> is an important cause of both haemorrhagic colitis and haemolytic uraemic syndrome. The latter is the most common cause of acute kidney failure in children. <i>E.coli</i> lives in the intestines of cattle and can contaminate meat during slaughter and dressing. An outbreak in Scotland in 1996 resulted in 21 deaths. Temperature range for growth - growth can occur at 7°-44.5°C, and possibly as low as 4°C with an optimum for VTEC around 37°C. Acid tolerant, will persist in frozen and chill conditions.</p>
<p>5. <i>Listeria monocytogenes</i></p> <p>Widely distributed in the environment in soil, foliage water and sewage, <i>Listeria</i> can be excreted by human and animal carriers. Any product of animal origin can harbour the bacterium. Often found in chilled or delicatessen products such as soft cheeses, pâté, cook-chill meals and ready to eat sausages. A low temperature, salt tolerant pathogen, this poses special problems for food handling and storage as standard refrigeration will not inhibit growth and the cells can survive for long periods even in unfavourable conditions. Can become established in food production environments surviving in biofilms. Temperature range for growth - growth can occur as low as 1°-3°C and up to 42°C</p>
<p>6. <i>Salmonella</i> spp.</p> <p>Salmonellosis is a major cause of food borne human gastroenteritis. The organism is found widely in the environment and in the gut of animals and man. Farm animals, wild birds and domestic pets are common reservoirs. Infection is most commonly associated with the consumption of meat (especially poultry and pork) and eggs and their products. Contamination commonly results from raw food coming into contact with ready-to-eat products. Temperature range for growth is between 6°-45°C.</p>
<p>7. <i>Staphylococcus aureus</i></p> <p>The organism is found on man, in cuts, pimples, boils, sores, on the hands and in the nose. Cows with infected udders also carry the organism. Transmitted to food by contaminated hands or equipment, or to milk from infected cows. A heat resistant toxin forms in the food at ambient temperature following growth of the bacteria. Illness is caused by ingestion of the toxin. Severity of illness may depend on how much toxin has developed. Temperature range for growth is usually between 7°-48°C with toxin being produced at between 10°-46°C.</p>
<p>8. <i>Yersinia enterocolitica</i></p> <p>Many members of the genus can grow under extremes of temperature and are well adapted to survive in the environment. Found in the guts of many species of wild and domestic animals and birds. Transmitted by contaminated food and water and direct contact with infected animals. Person to person spread may occur. Particularly associated with raw pork and pork products. Temperature range for growth is 0°-44°C with an optimum range of 32°-34°C.</p>