

TASK
FORCE
ON
E. COLI
O157

FINAL
REPORT

JUNE 2001

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CHAIRMAN'S FOREWORD

Susan Deacon MSP
Minister of Health & Community Care

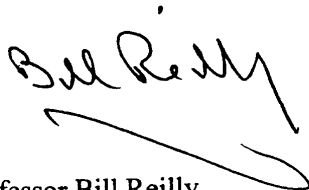
The Report which follows is the culmination of 10 months work by some 150 people. They brought light and depth, contrast and consensus. Sadness in the past was brought to us with hope for some benefit in the future. Well-established networks worked alongside wholly new collaborations. The resulting operation was a pleasure to chair.

Within our findings, there are some valuable old messages – like hand-washing – and some new science – like the genome sequencing of *E.coli* O157 or developments in analytical procedures. As new developments become established practice and awareness of the organism is raised, we should move ever closer to more ideal standards. For the moment we have worked on the basis of existing knowledge and have tried to find outcomes that are practical and proportionate to the risks identified. This is not to compromise or seek favour. It is to ensure, as far as we can, that the recommendations will be put into effect in a short timescale and messages, where necessary, are repeated at intervals thereafter.

I have identified three issues that I have taken out of the Report and placed up-front as personal recommendations directly to you as an expression of concern that the work we have done should have genuine effect. On behalf of the Task Force, I recommend that

- A budget(s) is/are assigned to adequately implement the recommendations, especially the education and awareness-raising exercises, with provision built in over time.
- The sponsoring departments establish an *E.coli* O157 follow up co-ordinator to ensure that implementation follows and again is up-dated as necessary over time.
- A stock take should be made of past and current research on *E.coli* O157 building on the work of the Microbiological Safety of Food Funders Group on “UK Publicly Funded Research on VTEC”, extending across all of the subjects that we have examined and pointing up the gaps to be filled by future work.

I am grateful for the opportunity to chair the Task Force and have pleasure in enclosing its Report.



Professor Bill Reilly
Chairman

June 2001

EXECUTIVE SUMMARY

KEY MESSAGES

- ***E.coli* O157 is common in cattle and sheep but rarely affects people**
- **When it does, it can strike with potentially disastrous consequences**
- **But the means of limiting the risks are in our hands - literally**
- **Handwashing still simple but most important message**
- **Necessity for regularly repeating hygiene message**

- Main source of *E.coli* O157 is from cattle and sheep
- Fresh animal faeces (direct excretion) is the highest risk
- Young children most at risk – ensure adequate supervision
- More cases of *E.coli* O157 now associated with environmental contamination including contact with animal faeces, contamination of water supplies, than with food

SETTING THE SCENE

We were aware that past events were relevant and that there were many interests affecting our work toward better protecting the public. The following gives a flavour of these:

- *E.coli* O157 is of relatively recent origin therefore cannot compare situation of 30 years ago
- Be aware of the risks
 - Sources in animals can pose a risk on farm, in countryside, in burns and streams
 - *E.coli* O157 needs only a few organisms to cause symptoms and disease
 - This makes it a severe challenge
 - Simple risk assessment can minimise risk
- Past outbreaks suggest main causes of infection were in food: more recent studies suggest most sporadic cases are from environmental sources
- Main symptom is diarrhoea
- May turn bloody – a key symptom
- Complications include
 - Haemorrhagic Colitis
 - Haemolytic Uraemic Syndrome
 - Thrombotic Thrombocytopenic Purpura

DIAGNOSIS

As diarrhoea symptoms are common we wished to focus the thinking of health professionals and the public on key indicators and actions. We also looked for most practical application of most recent thinking.

- The earlier the diagnosis the better
- If symptoms persist for 48 hours – consult health professional
- Bloody diarrhoea – consult health professional immediately

- All bloody diarrhoea cases or any diarrhoea symptoms in under 10s and over 60s – stool sample for analysis
- Laboratories to analyse all such samples for *E.coli* O157: positives to Scottish E Coli Reference Laboratory (SERL) for typing
- Establish a procedure to review our findings in the light of new knowledge and emerging diagnostic techniques

TREATMENT

In consultation with the professions we have made suggestions about clinical practices which may be helpfully taken further in consultation with the professional standard setting body.

- Wide programme of information/education - health care professionals
- public
- Review of clinical standards
- Antibiotics or anti-motility treatment may not be appropriate

CARE

Some of the most sensitive inputs that we received concerned patients' and carers' needs, and the lessons for advice and communication to patients and carers affected by *E.coli* O157.

- Wide programme of proposed information/support to patients, carers and families
- Recognition of individual needs

PERSON TO PERSON SPREAD

This was one area where the individual could make a real difference in creating barriers to the spread of infection – in the hospital, school, nursery, community centre, home.

- Raise awareness of *E.coli* O157
- Promote personal hygiene, especially hand washing, by public and staff of institutions
- Encourage culture of good hygiene
- Produce information for families/close contacts of cases of *E.coli* O157
- Consider criteria for exclusion from institutions of cases and contacts/siblings

SURVEILLANCE

To plan and respond in an informed way we need data collected in a targeted and organised manner. It is important also to trace back to sources and follow patients' progression to better understand the routes of infection

- Confirm/improve capture of laboratory and clinical data
- Integrate surveillance of human, food, animal and environmental sources
- *E.coli* O157 and HUS Registers need to be maintained

OUTBREAK MANAGEMENT

It is important to review contingency plans in light of the wide range of our work

- Clarify roles at national level
- Cairns Smith Group to review protocols and procedures at national and local level

ANIMALS/FARMING

While accepting for the present that we cannot overcome the presence of the organism in the animal population we found much that can be done by a range of interested groups to prevent it spreading to humans and the environment.

- Assume all cattle and sheep may excrete at some time
- At present there is no direct intervention, no vaccine, no feed, no practice which can reduce prevalence of *E.coli* O157 in the animals.
- Sampling and testing of animals is of limited value in risk assessment but it is useful to investigate specific cases
 - No clear action when *E.coli* O157 found
- More work needed
 - Longer term surveillance
 - Method to reduce carriage
- Farmers powerless to protect herds/flocks from *E.coli* O157
- Farmer/workers must have regard for risk to them from direct excretion, fresh manure and slurry
- Don't rely on perceived personal immunity of the past: *E.coli* O157 is new
- Farmers must consider risk to families, especially children, from cross contamination
 - Keep working clothes separated from the home and vehicles
 - Keep farm animals and working dogs separate from home and vehicles
- Reissue/revise direct guidance to farmers
- Promote use of Farm Waste Management Plans (FWMPs) e.g. for management of slurry storage

WASTE

Most material spread on land is not 'waste' at all but useful as a fertiliser; but it can cause risks and needs to be carefully managed.

- Pro-actively promote good farm waste management practice/guidance
- Revise and promote guidance on grazing, cropping and harvesting limitations
- Initiate awareness raising campaign on waste storage, practical treatment and application for farmers and contractors.
- Encourage waste management training for farmers and contractors
- Minimise volumes and leakage of contaminated water
- Need more Quality Control and Quality Assurance of wastes brought on to farm e.g. sewage sludge
- Review criteria for Waste Management Licensing exemption
 - Satisfy SEPA of pre-spreading risk assessment
 - SEPA being satisfied that spreading under exemption does not cause environmental pollution

ACCESS/RECREATIONAL USE OF LAND

To find a realistic basis for shared use of animal pasture land we have assessed the risks of ingesting contaminated soil and set a list of actions to allow activities to continue in greater safety.

- Keep farm animals off the fields for the preceding 3 weeks prior to use
- Keep farm animals off fields during use.
- Remove any visible droppings, ideally at the beginning of the 3 week period.
- Mow the grass, keep it short and remove the clippings before the fields are used for recreation.
- Always wash hands before eating, drinking and smoking i.e., use soap, clean towels and, preferably, hot and running water.
- Ensure adequate supervision of children, particularly those under 5 years of age.
- Ensure that water for consumption comes from a safe supply and consider a back up e.g. bottled water.
- Ensure that water from burns and streams is treated before drinking

VISITS TO FARMS

Understanding the risks to people visiting an unfamiliar setting helps a good deal in distinguishing the barriers and safety message that can allow most people to visit safely. There may be some, especially children, for whom special arrangements need to be made.

- Make core advice available
- Include risk and personal safety in school curriculum
- Farm/land management – increased education on pathogens
- Link enforcement to health and safety standards
- Ensure that all members of Associations comply with hygiene pre-requisites
- Promote use of risk self-assessment by farms with access to public and by groups visiting, especially when visits are with children; adopt generic risk assessment form
- Assess supervision levels according to risk.

WATER SUPPLIES

Where controls and monitoring are good, we saw a need to ensure a contingency plan for the unexpected. Where water quality was less well known, greater risk assessment was needed; and caution to ensure alternative mains supply, eg, boiling or bottled supply.

Public Supplies

- Ensure adequate monitoring, especially in high risk catchments
- Where treatment, on occasion, is inadequate issue boil water notices as necessary

Private Supplies

- Educate users and owners on risks associated with faecal contamination of supplies
- Protect and stockproof private water supply sources
- Apply a microbiological risk assessment protocol to all private water supplies

FOOD

Not the most common source of infection by *E.coli* O157 but still a potent source, potentially widely distributed. Much done in recent years but additional work is needed.

- Educate producers and consumers on correct handling of raw salad/vegetables.
- Improve labelling and traceability of cheeses, salads and vegetables.
- Heat treat all milk for sale for drinking, in England and Wales as in Scotland.
- Thoroughly cook minced meat products.

CHAPTER 1

THE TASK FORCE

In this Chapter

- We discuss our remit and methodology
- We describe the extent of the task

OUR PURPOSE

1.1 The Core Team of the Task Force was appointed by the Minister for Health and Community Care in September 2000 under the joint sponsorship of Food Standards Agency (FSA) Scotland and Scottish Executive (SE) Health Department with the following remit:

“In light of existing and emerging information on the incidence of *E.coli* O157 in Scotland, to:-

- Review the risk to health of the public in Scotland, and current activities to prevent human infection with *E.coli* O157.
- Assess the effectiveness of the present arrangements for co-ordination of action at national and local level.
- Consider what future measures would help protect public health.
- Report by May 2001”

1.2 In mid-2000 much of the post-Pennington research work commissioned in 1997 on animal sources and case control studies came to conclusion. In June 2000 the results of this research were made public at an **Open Forum in Edinburgh**. The significant finding overall was that the majority of sporadic cases¹ lay in environmental sources rather than in the food chain; however, the food chain retained potential to cause large numbers of cases from particular events. The Scottish Executive (SE), together with the newly-created Food Standards Agency in Scotland, saw a need to put this research output into a practical plan for action highlighting the range of sources of infection. The result was the **creation of this Task Force**, which commenced its work in September 2000. The Task Force was set up with the deliberate brief to be open and consultative, to gather information widely from scientific and professional sources and from practitioners and patients. In this case, the result was to be a *practical* action plan to improve the protection of the public from infection by *E.coli* O157.

1.3 The intention of the funding departments² in holding the Open Forum in June 2000 was to place the accrued evidence in the public domain. At the same time those responsible for leading the research would have the opportunity of discussing it with other interests. The research had addressed issues that had been of great concern in wake of the Central Scotland outbreak. It was anticipated that interest would be widespread.

¹ Single cases of disease apparently unrelated to other cases.

² Ministry of Agriculture, Fisheries and Food, Scottish Executive, Department of Health, National Assembly of Wales and the Food Standards Agency.

- 1.4 There was a particular Scottish interest in understanding why the cases of infection by *E.coli* O157 had been more numerous in Scotland and particularly in the North-east of Scotland. The Government's research interests extended to a range of pathogens but it was decided that research outcomes on *E.coli* O157 should be presented in Scotland. Some of the work had focussed on Scottish circumstances, some south of the Border. The event in Edinburgh was presented as GB outcomes. In addition, during the planning period for the Open Forum the Food Standards Agency had come into being (on 1 April 2000) bringing a further UK focus to the event.
- 1.5 In planning the event the Minister and the Departments looked for more than the public presentation of findings. They wanted action to follow. Although details were not clearly formed at that time, the proposal for a Task Force was agreed and announced at the Open Forum. It would focus mainly on the Scottish situation; but would draw upon relevant expertise or experience from further afield and plan for its findings to be applicable beyond Scotland.
- 1.6 Past reported outbreaks of *E.coli* O157 infection were associated mainly with food sources. The food chain remained at risk from the organism, but much had been done post-Pennington Report to improve knowledge, training practices and controls. Hence the Task Force was formed in response to evidence that showed that the majority of sporadic cases were associated with contact with animals or from the environment. This would take the Task Force into the following areas:-
- Animals/husbandry and routes of infection to the environment
 - Waste recycled to land
 - Risks to water supplies, public, private (and bottled)
 - Access to the countryside
 - Risks to the farming community and recreational use of animal pasture
 - The food chain
 - Diagnosis and patient care by health professionals including GPs, hospitals, and laboratories, but possibly extending to pharmacists, nurses, health visitors (NHS 24 Direct)
 - Person to person spread of infection, especially in families and in children, e.g. in crèches, nurseries and school infant classes
 - Epidemiology and outbreak control

COMPOSITION & WORKING METHOD

- 1.7 The Core Team of 9 appointed by the Minister (Annex 1) included expertise in epidemiology, public health, veterinary medicine, microbiology, agriculture, water supply, environmental health, and consumer interests. These specialisms would be essential to a broad understanding of the work done and conclusions reached earlier. The breadth of study within a relatively short time-scale required the involvement of much supporting expertise. Sponsoring departments made it clear that the importance of this work to Scotland demanded study in some detail, and as far as possible, openness and consultation.

- 1.8 The sponsors and Chairman took account of past and present practices in tackling policy issues with a broad stakeholder interest.
- The BSE Inquiry was huge in scale and quasi judicial in procedure. Public access was a lesson to follow.
 - The Review of BSE Controls had moved further towards stakeholders' interests although the latter still had less than a full role in the structure.
 - The Review of Red Tape in the Meat Industry was closer in scale and timescale to our embryo thinking. Here evidence was taken on paper and in person by a small core team. This seemed to us to be a very effective model in acquiring information but short on interaction among the parties giving evidence. We could envisage difficulty in receiving inputs fairly from a large number of individual interests. We expected interaction to allow us to identify extended lines of inquiry: the Red Tape mode would likely not permit that.
 - The Pennington Group was obviously of interest. Here a small expert group had received evidence, against a serious, continuing outbreak. Timescale must have been a priority both in practical and political terms. Food was the focus: for us the range of interests was greater. The report was a model that we might follow but we sought greater participation.
 - The Food Standards Agency Board³ had held its meetings in public, in the sense that the public could witness the proceedings but did not have access to take part in the business.
 - The Scottish Food Advisory Committee⁴ met in public, offering limited exchange of views with those attending.

CONSULTATION

- 1.9 Several models of consultation were considered for the Task Force – a small closed team, a small core group receiving presentations individually, a larger group with “top table” and other interests invited to observe. None gave the interaction and ownership that we sought. We therefore arranged an opening meeting of obvious interests across the fields of study at which a new model could be presented, which would allow significant numbers of participants a seat at the table equally with Core Team members. They would be able to engage in discussion of their subject interests and of other subjects. The model was endorsed at the first, open meeting and resulted in a series of subject meetings, each with its own membership of speakers and other participants. Threads of common interests ran through the series of subject meetings thus allowing those with multiple interests to contribute in related subjects.
- 1.10 The Task Force sponsors agreed to provide staff to create and implement the complex logistics of this model. A budget of £90,000 was provided for this task. The novelty, labour, and cost of this process was expected to be repaid in acquisition and discussion of evidence interactively among interested parties within a relatively short period. The Health Department would lead for Scottish Executive on account of the public health interest. The corporate structure of the Executive was seen to be helpful to the Task Force in facilitating access to the range of health and environment fields. Links to

³ The 14 strong Board is the management board of the UK Food Standards Agency. It has 2 members for Scotland who are the Chair and Vice Chair of the Scottish Food Advisory Committee.

⁴ The 11 strong Committee advises FSA on Scottish issues.

FSA/other departments' participants would be established as needed by the Secretariat; and Scottish Executive contacts could keep their counterparts beyond Scotland informed of progress. Notwithstanding this complex official network, the Secretariat was expected to establish an independent stance, dealing equitably with the main body of participants and officials.

- 1.11 The Core Team would provide the continuity as the membership attended meetings of interest to them. There was no distinction made at meetings between core and wider interest members. At the outset each member received a statement of intended operating practice which explained our commitment to their participation and procedures for communication with them. It also acknowledged the potential barriers in conflicts of interest, acute personal issues, etc. (Annex 2). In practice the arrangement worked well. The response of participants was excellent.
- 1.12 Our working method had to take account also of the need to produce an action plan to better protect the public from *E.coli* O157. The plan had to demonstrate priority, be practicable, and be proportionate to the risk. We therefore requested contributors to present the 5 top priority actions for their interests, where possible with some justification in science or in practical experience. The Task Force would then have to evaluate the many suggested actions, each in its own right and comparatively, one against another. We would also have to consider the proportionality of each action in relation to the risk that it was meant to address.
- 1.13 In the first seven months of our work, some 140 subject specialists (Annex 3) took part on an equal and very pro-active basis with the Core Team. Some had been selected by the Task Force and some had asked to take part: all have made a meaningful contribution. Arrangements for meetings were notified in advance and parties invited to indicate the topics in which they wished to contribute. Speakers were invited and briefed; and much attention was given to presentation media. It was important that presentations were effective and that material could be acquired for archive and onward use. As evidence was taken, it was progressively made available on the Task Force website: <http://www.foodstandards.gov.uk/scotland/ecoli.htm>
- 1.14 Our methodology was clearly at the innovative end of the consultation spectrum. Sensitivities and partiality were submerged beneath genuine contact and trust. As the Core Team directed the work through analysis towards conclusions, that communicative approach continued, to ensure that the action plan produced by the Core Team enjoyed the support of the wider group.
- 1.15 In practice, the scale of the exercise has proved to be larger than anticipated, reflecting the widespread concern about the organism and the specialist discussions required - some 150 in the whole team with 40 or so participating in each subject discussion. This methodology has scored significantly, however, in the willingness of all the parties to take part in a team approach, everyone round each meeting table attending as equals. Disparate views have tried to seek consensus, or at least common ground. Individual interests have shown a collective desire to move against this organism in a coherent, practical way. However, it might be a model suited mainly to high priority subjects where there were a number of cross-cutting issues to consider, as in this case.

- 1.16 In sifting through the huge amount of evidence accumulated earlier in our study, we found that much of it was in the form of reports and personal experiences and rather less in the form of firm numerical data. It has been impractical, therefore, to adopt a mathematical approach to risk assessment. We found also that the range of topics under consideration required a range of different approaches. Hence, we adopted a fairly pragmatic approach to assessing the recommendations and arguments put to us over the months. In the context of our wide-ranging study, we believe that this approach was effective and did provide the framework for concluding the key recommendations for our report. More is said of this in Chapter 3 “Risk”.
- 1.17 Given the range of interests involved, it was never likely that implementation of our findings would rest with the Task Force. Inevitably, each sector will have to review the parts of our report relevant to its interest and establish a means of taking the matters forward. In the first instance, our recommendations are addressed to the Scottish Minister for Health and Community Care upon whose authority we have operated; and in practice the impetus for implementation will lie with our major sponsors, the Food Standards Agency, Scotland, and the Scottish Executive. We have nevertheless tried to target recommended actions upon appropriate interests.

FORMAT OF REPORT

- 1.18 For benefit of communication in this Report we have adopted a style which is less formal than the scientific style that might be appropriate in other circumstances. References in the text to work, papers etc. that we considered are supported by acknowledgements and a bibliography (Annex 13). Where brief explanation might assist comprehension we have provided footnotes in the text and a glossary (Annex 12).
- 1.19 In this Report, we have adopted the expression *E.coli* O157’ in referring to the organism as this reflects our remit. Where we mean specifically Verocytotoxigenic *E.coli*, (VTEC) or “non O157 VTECs”, we have used those expressions deliberately.

ACKNOWLEDGEMENTS

- 1.20 The Task Force Core Team would like to acknowledge the central importance of the Task Force as a whole – see Annexes 3 and 13. The breadth of expertise provided was matched by individual quality and sharpness of focus. In addition to the participating bodies listed in Annex 3 there has been contact with individuals who have taken an active part in the work of the Task Force. Our sincere thanks is given to them unreservedly. We regard the inclusive approach as one of the most constructive and successful features of our study. Although we have operated as a team independent of government we have had the benefit of the corporate structure of Scottish Executive in accessing its many fields of expertise efficiently.
- 1.21 Our sponsoring departments, FSA, Scotland and SEHD, while maintaining their impartiality, have given freely of their time and expertise in helping to take the work forward.
- 1.22 The Task Force have appreciated the provision of a freestanding, full time Secretariat. The team was led by Mr Andrew Mackie with commitment and enthusiasm. His

breadth of knowledge across FSA and Executive functions was a major factor in the construction and execution of this operation. Jean Gilchrist brought both professional and executive skills to the management of evidence presented that was both extensive in scale and complex in character. Dianne Drysdale managed the office, the budget and arrangements for meetings. Linda Cay typed every word of the Report through many drafts and solved many problems in presentation.

We record our appreciation to them all.

CHAPTER 2

SETTING THE SCENE

In this Chapter we:

- Describe the organism and its effect on people
- Compare *E.coli* O157 with the risks from other organisms
- Learn from past outbreaks and cases

THE ORGANISM

- 2.1 The whole purpose of our work is to better protect the public from *E.coli* O157. Partly this implies action to reduce the prevalence of the organism at source(s) and partly to communicate widely a strategy of actions to avoid or minimise the exposure of the public to it.
- 2.2 The few novel and rare cases of infection from *E.coli* O157 that did occur meant that the knowledge base built up slowly. It seemed to us a gross irony that an occasional outbreak, and significantly the Central Scotland outbreak of 1996-97, was one way to provide helpful experience and information to extend our knowledge of the organism and its effects.
- 2.3 Because of fairly wide interest in our work and the openness of our consultation process, the Task Force has had no shortage of input. We have drawn upon outbreak material, research reports and personal contributions by many people very close to past and recent events. Material has been frequently technical and practical; and sometimes emotional. Here and elsewhere in this Report we record some quite inspirational contributions from families and carers which have helped to sharpen our focus.
- 2.4 Three of the threads running throughout this report are
 - The relatively recent evolution of *E.coli* O157
 - The hundreds of (generally) harmless strains of the bacterium *E.coli*
 - The small number of *E.coli* O157 organisms needed to produce infection
- 2.5 The Task Force concluded that an understanding of the factors affecting infection by *E.coli* O157 could not be achieved adequately without appreciating something of the science of the organism. In doing this it would be unhelpful to over simplify. In the text which follows we have excluded the more detailed levels of precision but, even so, we are left with a necessarily complex set of ideas. As the science is linked to the aspects of our study elsewhere in the report we have found it easier to use more communicative language.
- 2.6 *Escherichia coli* (*E.coli*) is a bacterium, most strains of which live harmlessly in the gastro-intestinal tracts of people and animals. However a few types have acquired virulence factors. These organisms are often harmful to people and can cause severe disease. Particularly important factors are toxins. One group of toxins was originally recognised by their ability to kill cultured Vero cells, (African green monkey kidney cells) hence the name Verocytotoxins (VTs). The toxin-carrying *E.coli* therefore became known as Verocytotoxin-producing *E.coli* (VTEC).

- 2.7 In the laboratory *E.coli* of all kinds are classified by identifying the antigenic¹ structure of two different molecules on their surface, O and H. There are more than 170 O serogroups. These can be subdivided into H serotypes. In the UK the overwhelming majority of VTECs causing human disease fall into serotype O157:H7, although other serotypes are not looked for in most laboratories.
- 2.8 In addition to VTEC belonging to serogroup *E.coli* O157, other groups such as O111, O26, O103 and O145 have been identified as emerging pathogens throughout Europe. Presentations at “VTEC 2000”² reviewed the clinical importance of non-O157 VTECs across the world. Non-O157 VTECs have been reported in Germany, Ireland, Finland, Hungary, Czech Republic, Japan and the USA. In Scotland in the last year, only one non-O157 VTEC (O46) was identified at the Scottish *E.coli* Reference Laboratory (SERL).
- 2.9 Although verocytotoxin genes are necessary to cause serious disease, they alone are not sufficient. Indeed, many other *E.coli* strains have these genes but are not particularly pathogenic. Additional virulence factors are needed. In *E.coli* O157, the best studied example, some are coded by genes on a length of DNA in the bacterial chromosome called a pathogenicity island; they include proteins that help the organisms to adhere to the large bowel wall. Others are coded by genes on a plasmid³. The most common kind of severe disease caused by these organisms is haemorrhagic colitis and so as a group they have been called enterohaemorrhagic *E.coli* or EHECs.
- 2.10 On an evolutionary time scale *E.coli* O157 (and other VTEC) are brand new, the first outbreaks caused by them occurring less than twenty years ago. It was first identified as a cause of human illness in 1982 in the USA, and there have since been numerous reports world-wide of infection with the organism. Professor Pennington, in his report of 1997 into the Central Scotland outbreak, described it as a ‘particularly nasty
- 2.11 The infectious dose⁴ of *E.coli* O157 appears to be very low, probably less than 100 organisms and possibly as low as 10. People can become infected through contact with the faeces of infected animals, by passing the organism from person to person, or by the consumption of contaminated foods or water.
- 2.12 The organism is easily killed by heating e.g. 70°C for 2 minutes or equivalent – see figure 2.1- but can survive well in frozen storage. It grows easily in temperatures between 10°C and 45°C. It is fairly acid resistant and can grow easily in a fairly acidic environment.

¹ Antibody producing.

² International symposium on VTECs in Kyoto, Japan in November 2000.

³ Transferable DNA among bacteria.

⁴ Number of bacteria necessary to produce an infection.

Figure 2.1

EQUIVALENT HEAT TREATMENTS

TEMPERATURE °C	TIME
60	45 minutes
65	10 minutes
70	2 minutes
75	30 seconds
80	6 seconds

Source: Reproduced from “Safer Cooked Meat Production Guidelines”

- 2.13 Although *E.coli* O157 strains are closely related to each other genetically, many isolates can be distinguished from each other by typing methods. These are useful in the investigation of outbreaks as a fingerprinting approach to track the spread of a particular strain. Worldwide more than 80 types can be distinguished by bacteriophage⁵ typing; however, the majority of isolates made in Scotland since 1998 from cattle and from humans have been of phage type 21/28. Pulsed field gel electrophoresis (PFGE)⁶ is widely used as a fingerprinting technique; a significant number of phage types occur in the UK and in Scotland at the present time.
- 2.14 The recent publication in the journal “Nature” of the virtually complete genome sequence⁷ of a 1982 USA *E.coli* O157 isolate identified just over 5,400 genes. The most striking findings were how different the sequence was from that of a non-pathogenic strain of *E.coli* and that many of these differences could be attributable to the transfer of DNA from other bacteria. It is hoped that those findings will assist in a better understanding of the organism and improved diagnostic techniques. **We recommended further research be carried out to identify why the virulent genes⁸ which can cause disease in people are not ‘switched on’ in animals or otherwise do not affect them.**

HOW *E.COLI* O157 AFFECTS PEOPLE

- 2.15 Fortunately infection from *E.coli* O157 is relatively rare. Its principal symptom, diarrhoea, is also a very common symptom from other gastrointestinal infections. This has meant that the relatively few *E.coli* O157 cases identified have had to be found from among many more infections with this routine symptom.
- 2.16 *E.coli* O157 infections are associated with a range of illnesses in humans, although a proportion of infections may be asymptomatic⁹. Where symptoms do occur, the incubation period – the interval between exposure to the organism and the onset of symptoms – is between 2 and 10 days, with most cases occurring in a 3-5 day period.

⁵ A virus which destroys bacteria.

⁶ A process which accurately identifies O157 subtypes.

⁷ A graphical representation of the structure of a cell of the bacterium, showing which individual genes are attached in which sequence.

⁸ Those capable of causing [severe] symptoms in a susceptible individual.

⁹ Where the person infected does not suffer any resulting symptoms or disease.

The range of clinical disease includes

- Mild diarrhoea, fever, abdominal pain, vomiting
- Haemorrhagic colitis (HC), which consists of inflammation of the large bowel, with severe bloody diarrhoea
- Haemolytic Uraemic Syndrome (HUS), a combination of anaemia, acute kidney failure and low platelet count, which may be accompanied by fever
- Thrombotic thrombocytopenic purpura (TTP) characterised by fever, with skin and central nervous system involvement, resulting from aggregation of platelet in various organs.

- 2.17 Cases with bloody diarrhoea have been observed to have a more severe clinical course than cases with non-bloody diarrhoea and may require hospitalisation. Symptoms usually resolve within 2 weeks. It is possible that there may be a greater proportion of cases with non-bloody diarrhoea than are reported, as the illness is milder and patients may not consult their doctor or be fully investigated.
- 2.18 The full number of cases of *E.coli* O157 infection, including those infected who do not attend for diagnosis or are not diagnosed, might not be known accurately. Haemolytic Uraemic Syndrome Help (HUSH) suggested that under-reporting of cases might conceal a further 30% of the currently known volume of infection. The risk of under reporting has to be borne in mind, however, a major study of gut infections conducted in England (the IID study¹⁰) did not reveal any hidden infections.
- 2.19 Past work suggested that, typically, HUS following VTEC infection presents in about 10% of patients about a week after the onset of diarrhoea. It is characterised by kidney failure, anaemia and a low platelet count. Dialysis may be required during the acute phase. Although the progress is generally good in children, some patients may develop long-term complications, such as high blood pressure and chronic kidney failure in later life.
- 2.20 In TTP, in addition to kidney failure, the main features are fever and an extremely low platelet count associated with the formation of clots, giving rise to severe neurological impairment. It may rarely present in the absence of preceding diarrhoea, affecting adults rather than children, in which case the prognosis is poor.

HOW DOES *E-COLI* O157 RATE COMPARED TO THE RISKS FROM OTHER PATHOGENS?

- 2.21 Figures 2.2 – 2.4 below show the number of cases and trends in *E.coli* O157, salmonellosis, and campylobacter reported in Scotland in recent years. The significant features are
- The relatively low numbers of cases of *E.coli* O157. Apart from 1996-97, when the Central Scotland outbreak was current, there have never been more than 300 cases in a year.
 - The relatively low infectious dose – perhaps as few as 10 organisms of *E.coli* O157 compared to 500 in campylobacter and in excess of 100,000 – 1 billion of

¹⁰ A study carried out to estimate the number of cases of gastroenteritis, or intestinal, infectious diseases occurring in the population of England.

organisms in salmonella (varies with the salmonella species). Some people may be more susceptible than others e.g. the immuno compromised.

Relative incidence of 3 organisms

Figure 2.2

E. coli O157 Reported in Scotland 1984 - 2000

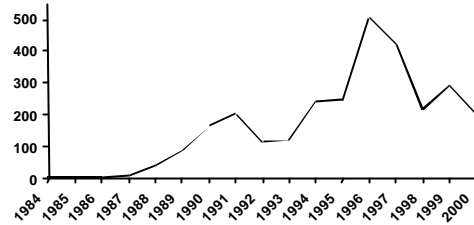


Figure 2.3

Campylobacter Reported in Scotland 1980 - 2000

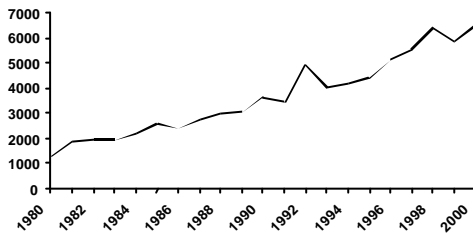
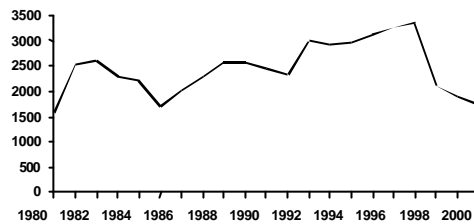


Figure 2.4

Salmonellosis Reported in Scotland 1980 - 2000



Source: Scottish Centre for Infection and Environmental Health

2.22 Figure 2.5 demonstrates the number of cases and trends in *E. coli* O157 reported in Scotland, England and Wales and Northern Ireland. This shows the high rate of isolation in Scotland in comparison to England and Wales and Northern Ireland.

Figure 2.5

E. coli O157 Faecal Isolations from Humans

Year	England and		Scotland		Northern Ireland	
	Number	Rate#	Number	Rate#	Number	Rate#
1995	792	1.53	247	4.81	7	0.42
1996	660	1.27	506	9.87	14	0.84
1997	1087	2.08	423	8.26	25	1.49
1998	890	1.70	216	4.22	24	1.42
1999	1084	2.06	294	5.74	51	3.01
2000	896	1.70	210	4.10	40	2.36

Rate per 100,000 population

Source: Public Health Laboratory Service

WHAT WE DON'T KNOW

- 2.23
- Why virulent genes can cause serious infection in people but appear not to affect animals
 - Why incidence is different in different geographical areas e.g. Grampian vs Glasgow (paragraph 1.4 and figure 2.6)
 - The ways in which the organism is evolving. As is stated earlier in this chapter, the genetics of the organism are beginning to be understood but we are still only at the frontier of this work.
 - The progress of individual cases over time. It seems that patients suffer effects in very individual ways and we need to be able to feed back our understanding of these situations into improved care. More is said under “surveillance” in Chapter 4.

Figure 2.6

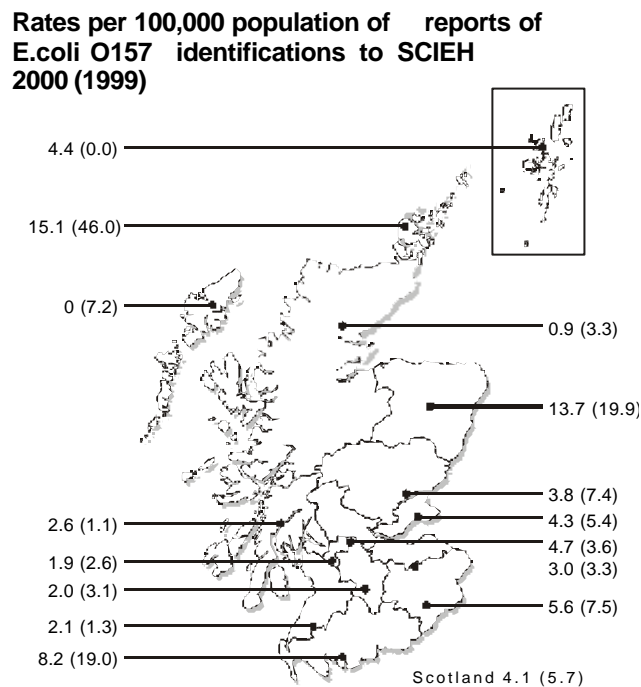


Figure 2.6 illustrates the difference of incidence of *E.coli* O157 in the Health Board areas.

- 2.24
- Figure 2.6 confirmed the assumption that the incidence of reported cases were greatest in the Grampian Health Board area, followed by Dumfries and Galloway. The apparently higher incidence in Orkney was a consequence of the number of cases in a relatively small island population. No firm evidence was received by the Task Force on the reasons for the recorded distribution across Health Board areas. Participants have speculated about the greater exposure of people to sources of the organism, either through occupational contact or through participation in the countryside which bring hands and mouth into close contact with animals or cross contamination within the environment.

WHAT DO PAST OUTBREAKS REVEAL ABOUT SOURCES AND CAUSES?

- 2.25 The Task Force work arose out of past events and we must look first at those, and the lessons learned from them. Looking back, with the benefit of hindsight, it is easy to forget that infection by *E.coli* O157 was a comparatively new phenomenon in the 1990s. Although relatively rare, infection by *E.coli* O157 resulting in death led to a number of significant **investigations** which form part of the backdrop to our work.
- 2.26 **Home-made cheeses from Grampian** in north east Scotland caused the death of a young child and affected 22 people in 1994. Investigation found cheese made on premises unknown to the Local Authority, and sold through informal, untraceable networks. Traditional methods of cheese-making were known to be compatible with modern hygienic practice if accompanied by an understanding of risks and controls. So a study by SEERAD¹¹ (formerly SOAEFD) led to the formation of a Scottish Study Group involving SOAEFD, Dr John Curnow (then Consultant in Public Health Medicine, Grampian Health Board) and representatives of The Scottish Food Coordinating Committee. The thinking of that group became integrated with similar work in England by The Specialist Cheesemakers' Association to produce the Cheesemakers' Code of Best Practice.
- 2.27 In 1999 continuing concern, especially in relation to raw milk handling and traceability of product, led to the setting up of a further expert group chaired by Dr Curnow, the results of which, published in December 2000, complemented and expanded on the Cheesemakers' Code of Best Practice.
- 2.28 The death of a small child together with 71 cases of illness in **West Lothian** in 1994 was believed to have resulted from **contamination of pasteurised milk** with *E.coli* O157. Subsequent investigations in a dairy found *E.coli* O157 in the milk line from the pasteuriser to the bottling plant and pointed to the need for good maintenance and careful management of pasteurisation equipment, supported by good record-keeping and avoidance of subsequent cross-contamination of the product. This event was the subject of a further report "**an Economic Assessment of an Outbreak**".
- 2.29 In 1995 the Government Advisory Committee on the Microbiological Safety of Food (ACMSF) established a sub-group chaired by Dr Norman Simmons to study **VTEC in the food chain**. The result was a set of 20 recommendations concerning the preventative measures in the environment and within the food chain and relating to treatment and care of those affected. A summary of the recommendations and follow up actions are shown in Annexes 8, 9 and 10 of this report.
- 2.30 In November 1996 21 elderly people died in Wishaw, **Central Scotland**, 17 of whom were subsequently found to have been affected by *E.coli* O157. In total 496 persons were thought to have become ill after consuming meat products from a butcher's shop in Wishaw, and which were found to have been distributed widely throughout Central Scotland. The landmark Report of the group led by Prof. Hugh Pennington looked closely at procedures for preparation and sale of raw and cooked meat products, and made 32 recommendations on the management, distribution and handling of such

¹¹ Scottish Executive Environment and Rural Affairs Department

products. The findings of the Fatal Accident Inquiry into the Central Scotland Outbreak gave added weight to the factors identified in the Pennington Report. The Pennington Report and FAI findings sparked a significant sharpening of focus on food handling and the minimisation of potential pathogens. An update of the recommendations and follow up actions are shown at Annexes 8, 9 and 10 and some are discussed more fully in Chapter 9 “Food”.

- 2.31 In the wake of the Pennington Report (1997), research was commissioned into the **prevalence of *E.coli* O157 in cattle and sheep**, the principal suspected source. At the same time the (former) Scottish Office commissioned work to review current policies on disposal of **organic waste on land (OWL)**. This would help to provide a better understanding of the relationships between animals as a source of waste material, the recycling of waste on land and subsequent use of such land for feeding animals or for growing crops. The study by the Scottish Environment Protection Agency (SEPA) reported in 1998 with a comprehensive paper, including 13 recommendations for better environmental and public health protection.
- 2.32 In May 1999 an outbreak of *E.coli* O157 occurred in a primary school in Macduff. 24 children and 3 adults were affected after consuming **home produced cheese made from raw goats milk**. There was no cheese remaining to test for *E.coli* O157 but it was isolated from both goat milk and the goat faeces. The cheese had been produced by a relative of one of the pupils in her own kitchen, as part of a tasting session for the children of locally produced foods. Subsequent investigations revealed that the cheese had been left in the classroom, in a warm environment, for many hours prior to being eaten by the pupils and teachers.
- 2.33 An outbreak of *E.coli* O157 infection occurred at a campsite in the Highland Region in the summer of 1999. Six people, mainly children, were affected. The same strain of organism was isolated from the water, the sheep and from the people affected. The source of the outbreak was traced to an untreated, unprotected private water source in a rural area where animals grazed freely.
- 2.34 In May 2000, 300 members of the **Scouting Association** attended a **Millennium camp at New Deer, Aberdeenshire**. Twenty people who attended the camp were infected with *E.coli* O157. Prior to the camping event 300 sheep and lambs had been grazing on the site for 6 days, and were removed from the field only the day preceding the camp leaving the field covered in faeces. The weather at the time of the camp was atrocious, it was cold, extremely wet and very windy resulting in parts of the camp site ending up like a ‘mud bath’ and the camp eventually having to be abandoned. *E.coli* O157 was subsequently isolated from the sheep droppings, tents, climbing equipment, soil, and from clothing and footwear, indicating that this was an outbreak **caused by environmental contamination**.
- 2.35 As can be seen from the foregoing, much of the early investigation of infections from *E.coli* O157 related to outbreaks from contact with the food chain and it was certainly clear to us that single contaminated food sources, widely distributed, can still affect large numbers of people. However, cases caused by environmental infection were known also. We noted work from as early as 1992 that began to detect this lesser-appreciated route of infection. **Case control studies** were commissioned in Scotland

and in England to gain a clearer impression of the range and significance of risk factors in sporadic cases occurring across the country.

2.36 Case control studies identified the following risk factors:-

Scottish case control study (1996-99):-

- Visiting farm, smallholding, or zoo
- Contact with farm or zoo animals and soil
- Garden next to field or farm
- Contact with soil
- Contact or likely contact with animal faeces other than pets

English case control study (1996-97):-

- Travel within the UK
- Eating food bought from stall, etc.
- Exposure to recreational waters (paddling)
- Visits to farms

We recommended that continuing research into the epidemiology of individual cases and outbreaks is undertaken.

2.37 By mid-2000 the bulk of the research work commissioned in 1997 on animal sources and case control studies came to conclusion. In June 2000 the results of this research were made public at an **Open Forum in Edinburgh**. The significant finding overall was that a large proportion of sporadic cases, lay in environmental sources rather than in the food chain; however, the latter retained potential to cause large numbers of cases from particular events. The result was the **creation of this Task Force**, which commenced its work in September 2000, as explained in Chapter 1.

2.38 In November 2000 an international symposium **International “VTEC 2000”** was held in **Kyoto, Japan**. This was one of a series of occasional events to focus upon *E.coli* O157 worldwide and was attended by a number of the key players from the UK. Among the lessons derived from this event was the acknowledgement that VTECs appeared in different forms in different countries. While *E.coli* O157 was the principal strain in the UK, others presented more commonly in other countries. Experience in Italy suggested that the principal causal organisms there changed over time, *E.coli* O157 predominated until 1997 when *E.coli* O26 became the most commonly identified serogroup. It was necessary therefore to look both at the current form of the organism and its evolution over time.

2.39 As the Task Force progressed through the several topics of its study, we reviewed implementation of relevant past recommendations, i.e. ACMSF, Pennington Report and the Central Scotland Fatal Accident Inquiry. Almost all of the recommendations had been implemented over time, but we thought it necessary to make a vigorous review of the follow up to these past recommendations (Annexes 8, 9 and 10). Significantly also, some recommendations from the past remain valid today. For example, the need to promote high standards of personal hygiene seemed repetitive and self-evident but remained vitally important.

- 2.40 **The expectation in the Pennington Report that communication and education processes within the food chain and within the home would have to be repeated regularly is recommended again by the Task Force.**
- 2.41 It may be a temptation to conclude that reports such as the Pennington Report have failed to communicate an adequate message when examples are seen of obviously poor hygiene practices. **The Task Force reasserts the Pennington Report in this respect and recommends the need for an ongoing drive to alter the public culture by education and improved understanding.** The Kyoto symposium heard that Sweden claimed to have significantly reduced the number of cases of *E.coli* O157 mainly by a concerted programme of communication and education. Our report deals with this in more detail in Chapter 10.
- 2.42 In this report you will find numerous references to the problem or hazard, to risk (the probability that the problem may arise) and measures for reduction or elimination of that risk. We comment further in Chapter 3 “Risk”.

SUMMARY OF RECOMMENDATIONS

- **Further research be carried out to identify why the virulent genes which can cause disease in people are not ‘switched on’ in animals or otherwise do not affect them.**
- **Continuing research into the epidemiology of individual cases and outbreaks is undertaken**
- **Communication and education processes within the food chain and within the home to be repeated regularly**
- **An ongoing drive to alter the public culture by education and improved understanding**

CHAPTER 3

RISK

In this Chapter we:

- Consider the factors affecting risk
- Discuss the possible application of those factors to risk from *E.coli* O157
- Consider 3 examples in more detail

HOW THE TASK FORCE APPROACHED RISK

3.1 The Remit given to the Task Force began

“In the light of existing and emerging information and the incidence of *E.coli* O157 in Scotland, to:-

- Review the risk to health of the public in Scotland, and current activities to prevent human infection with *E.coli* O157...”

3.2 It was inevitable, therefore, that we would have to find a way of dealing with risk-related subjects across the wide range of our study. In order to focus our work on a practical action plan we asked speakers and other participants to concentrate upon the 5 or so priority actions for their interests. We asked for proposed actions to be justified where possible in science or other basis and had hoped ourselves to make a risk assessment of such evidence as it was received.

3.3 We became aware quite quickly that the evidence we were receiving was only partly the result of past research, in which case at least some of it would be numerical. Much of the evidence was descriptive in nature, based upon personal experience, observation or non-scientific recording. The latter type of evidence was rich in detail and character, often painting quite precise pictures of circumstances which greatly informed our discussions. As proceedings progressed, however, the Task Force became more and more persuaded that our judgements of risk and responses to it were likely to be to some extent mathematical but with a strong element of value judgement.

3.4 In the context of evidence-based policy making, we noted a paper “Professional Policy Making in the Twenty-first Century”, Cabinet Office (CO) (1999), which stated

“The raw ingredient of evidence is information. Good quality policy making depends on high quality information, derived from a variety of sources – expert knowledge, existing domestic and international research; existing statistics; stakeholder consultation; evaluation of previous policies; new research, if appropriate; or secondary sources, including the internet. Evidence can include analysis or the outcome of consultation, costings of policy options and the results of economic or statistical modelling.

There is a tendency to think of evidence as something that is only generated by major pieces of research. In any policy area there is a

great deal of evidence held in the minds of both front-line staff in departments, agencies or local authorities and those to whom the policy is directed.”

We judged that the foregoing fully justified the process that we had adopted and, also like us, had placed a high value of the evidence thus obtained.

- 3.5 That CO document also described a number of competencies which were key elements of the policy-making process. These included many elements that Task Force members would recognise as part of our structure e.g. forward looking, outward looking, innovative and creative, using best available evidence from a wide range of sources, inclusive, joined-up. Although we had not drawn our process from the CO paper, it was heartening to find similar thinking at the centre of government.
- 3.6 The Task Force methodology had a great deal to do with the contribution of individuals and interested groups. With the Task Force membership eventually numbering some 150 parties (Annex 3), we acquired a certain confidence in circulating papers for information and comment among this diverse group. The contributions that they had made were relevant and valuable and the Core Team felt confident that the Task Force membership was perfectly capable of dealing with complex arguments – provided that the language and communication did not create artificial barriers.
- 3.7 There was inevitable overlap between the issues discussed in this chapter, especially those concerning risk communication and risk management, with discussion in Chapter 10 “Education and Communication”. We have not sought to eliminate this kind of overlap entirely given that it does provide a link between the process (in this chapter) and the implementation in Chapter 10.
- 3.8 The Task force gathered evidence which enabled it to define the hazard and the main ways people can come into contact with the hazard. Assumptions were made about the chances of people coming into contact with *E.coli* O157 and developing illnesses (risk assessment). These are detailed below. Based on these, the Task Force indicated the main ways we should try to reduce the risk (risk management) and inform the public about risk (risk communication).

Definitions

- 3.9 Risk is the probability of something happening to a person or a group of people in a certain time. Here we define risk as:
The probability that people will be exposed to and affected by E. coli O157 to the extent that it damages their health.

The sources of *E. coli* O157

- 3.10 The organism lives in the gut of humans and animals. It is particularly common in the intestines of grazing animals especially cattle and sheep. In public health terms, these are the reservoir of the hazard. Recent research in Scotland has shown that 8.6% of cattle shed *E.coli* O157 and 23.7% of herds have at least one shedding animal. Cattle do not become ill with *E.coli* O157. We therefore had no idea which animals had and which animals did not have it. There is no test available to determine whether cattle are

infected with *E.coli* O157. However, **given the high proportion of cattle infected we therefore considered it prudent to assume that all cattle carry *E.coli* O157. Although limited prevalence studies suggested the proportion of sheep carrying may be smaller, we considered it prudent to adopt the same assumption for sheep as for cattle.**

- 3.11 *E.coli* O157 is shed by animals in their faeces. Cattle and sheep faeces are shed onto pasture and contaminate the grass or soil. Faeces can contaminate the animal’s coat or the carcass at slaughter. The chance of contamination will depend on the number of organisms contained in the faeces (organism load) and how long they survive as viable i.e. able to cause infection.
- 3.12 Animal droppings in the form of slurry or manure are a natural product of agriculture which are recycled on to farm land as a fertiliser. Given the need to dispose of the large volumes produced on-farm, this recycling process is therefore inevitable. However the risk it poses may be reduced by treatment or decay during storage as described in Chapter 6 “Organic Waste on Land”.
- 3.13 Data from environmental research into the outbreak at New Deer, Aberdeenshire showed that the organism could survive a minimum of 105 days in soil in certain climatic conditions. Evidence from the SCIEH case control study (see paragraph 2.36) shows that contact with faeces is the most common risk factor associated with infection in cases. **Given this and the fact that the organism load is highest in fresh faeces, the Task Force considered that faeces recently shed from cattle or sheep were more likely to contain a higher organism load than that shed previously.**

Figure 3.1. summarises the risk factors from the main sources of the hazard.

Figure 3.1

SOURCES OF THE HAZARD	RISK FACTORS
Cattle/Sheep	<ul style="list-style-type: none"> • Reservoir • Prevalence
Faeces	<ul style="list-style-type: none"> • Shedding • Organism load • Survival/decay
Waste	<ul style="list-style-type: none"> • Types • Organism load • Survival/decay • Treatment • Current management

How can we come in contact with *E.coli* O157?

- 3.14 For people to fall ill with *E.coli* O157 infection, the organism must pass from these sources to their gut. Once a person is ill he or she can then spread the organism to others by contaminating food or their fingers with their own faeces and thus enable the organism to enter another person’s gut.

3.15 The Task Force heard reports on recent outbreaks of the illness and was informed of the results of studies from different parts of the UK about which factors were most associated with the occurrence of infection in sporadic¹ cases. These are by far the majority of cases.

3.16 From that evidence received, the Task force categorised the main ways humans can be exposed to the organism as:

- Direct contact with animals or their faeces e.g. during a visit to a farm;
- Occupational (i.e. working with animals or in settings where animals are regularly present);
- The recreational use of land e.g. camping on land contaminated with *E.coli* O157 leading to soiling and accidentally eating or drinking the organism;
- Water i.e. drinking water from a supply contaminated with *E.coli* O157;
- Food i.e. eating a food contaminated with *E.coli* O157;
- Person to person i.e. spread from an infected person to one who is not infected in a family household or institution such as a nursery

It is worth noting that evidence from Scotland points to people being exposed to *E.coli* O157 more frequently by contact with farm animal faeces than by food is supported by the case control study carried out in England.

3.17 Figure 3.2 summarises the factors that we considered in relation to the risk from sources of infection and how it should be managed. The following chapters describe the outcome of the Task Force’s use of this approach to reducing the risk of the public being exposed to *E.coli* O157 and of developing infection and its complications.

Figure 3.2

SOURCES	EXPOSURE	FACTORS IN RISK ANALYSIS	TYPE OF RISK	INTERVENTION
Cattle	Direct Contact	Nature	Absolute	Information
Sheep	Occupational	Settings	Relative	Education/training
Water	Water	Volume/load of O157	Quantitative	
Faeces	Food	Periodicity	Quantitative	Advice/guidance
	Recreational use of land	Frequency	Qualitative	
Waste	Person to person	Population/groups	Contributory	Regulation
		Infectious dose		
		Dose response		

¹ Single cases of disease apparently unrelated to other cases.

- 3.18 It seemed to us that the routes of exposure listed above were not exclusive. Direct contact might be occupational or caused through recreation. Person to person spread might well be from farm worker to family e.g. through inadequate separation of working clothes or through common use of vehicles for business and domestic purposes. Person to person spread became important to us as susceptible individuals came together e.g. children in nurseries or playgroups, old people in nursing homes or at pensioners' dinners.
- 3.19 Food and water supplies – certainly as regards public water supplies – were thought to be avenues of infection normally well protected; but, because of the wide distribution chain involved, they had the potential to affect a large number of people over a wide area if infection succeeded in overcoming the controls.
- 3.20 In “recreational use of rural land” we found that the risk could be readily graded according to the activity undertaken. Accordingly, we have attempted in Chapter 8 to tease apart the range of activities and show how the highest risks relate to those which bring the hands and mouth potentially into contact with contamination. This was a complicated part of our thinking because the risk depended upon a number of factors in parallel – previous use of land, previous and current weather conditions, activities, facilities, susceptibility of individuals. However, we did not think that the complexity made self-assessment of risk more difficult than in other circumstances. Once a basic understanding was achieved of the routes of infection, much of the rest was common sense.
- 3.21 The New Deer incident was not at all typical in that a number of the risk factors came together to give a much higher risk than one might normally expect. There was, we thought, one almost unique factor in this case - that the event was part of a Millennium Camp taking place over the whole of the UK and therefore pressed ahead even in the most adverse conditions in order to allow the children to take part in the Millennium experience. This demonstrated to us that there may well be the occasional, wholly unpredictable factor.
- 3.22 One risk factor that took our attention particularly was that of populations and groups. As noted in Chapter 4, we were very keen to understand whether any work had been done on ages of responsibility of children i.e. ages at which children might be thought able to understand concepts of personal hygiene by teaching or by following example. This was important to us in relation to controls within institutions e.g. playgroups, nurseries, schools, and in relation to childrens' exposure to animal contact at events such as organised farm visits. We were disappointed to find no evidence of past work despite a large amount of assistance, for example, by contact with infection control nurses within the National Health Service Scotland and through a literature search carried out for us by the Royal College of Physicians in Scotland. Unfortunately, therefore, we were not able to make particularly well informed judgements about critical thresholds for such activities. Because of the evidence of infection and death at ages under 5 we set our threshold, e.g. for testing and analysis of stool samples at 10 years.

What are the chances of people coming into contact with the organism

3.23 The Task Force heard evidence about the factors influencing the likelihood of people being exposed in these ways. These are discussed in more detail in the following chapters. In particular we tried to review for each type of exposure:

- The nature of the exposure (i.e. how it occurred in practice);
- The setting (i.e. where it was more likely to occur);
- The volume or load of *E.coli* O157 likely to be passed on to humans through this exposure;
- The periodicity i.e. how long did the exposure last e.g. transient or enduring;
- The frequency i.e. how often was it likely to occur;
- Which groups of people were most likely to be exposed;
- How many could be affected (i.e. develop illness as a result of being exposed (the dose response)

Some examples in more detail

3.24 The Task Force did not commission specific risk assessments on each type of exposure. Rather it took evidence, discussed it and came to a judgement on the likelihood of the public or groups within it being exposed to the organism. However three areas were explored in some detail:

New Deer Camp, Aberdeenshire

3.25 The first was the contamination of soil or grass with *E.coli* O157. We were shown methodology by the University of Aberdeen that used a useful model built upon the evidence obtained from the site of the scouts' camp at New Deer, Aberdeenshire, where 20 children were infected by *E.coli* O157 (plus other organisms) in May 2000. This proposition used data available from the time of the event and from subsequent monitoring of the site on volume and organism load, together with carefully managed assumptions. The product was an indication of probability, a range of options which might allow modelling in a similar way in other contexts.

3.26 The model was described to us as originating in dose response studies, where volunteers ingest doses of pathogenic micro-organisms of different concentrations and the modellers calculate the percentage that become ill. In the case of *E.coli* O157, however, there is little such information available. Dose response studies on *E.coli* O157 are problematical because of the potential risk to volunteers from even a small number of organisms. The modellers therefore attempted to predict the risk from *E.coli* O157 based upon

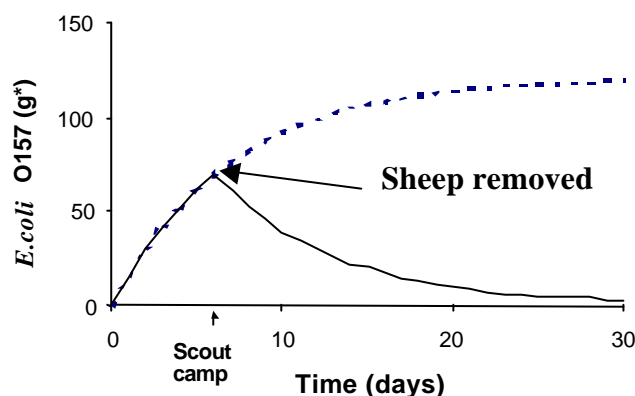
- Numbers of *E.coli* O157 in the field
- Decay rates in faeces in soil
- Quantity ingested by people in the field

3.27 At New Deer sheep had been on the site for 6 days immediately prior to the camping event. In the outbreak investigation 80% of the ewes were found to be *E.coli* O157 positive. At the time the scouts arrived the shedding rate on to the field was estimated

to have been 10^{10} *E.coli* O157 per day (10,000 million organisms per day!). The modellers estimated that this equated to 80 organisms of *E.coli* O157 per cm^2 of soil. Ingestion of soil by children during camping activities has been estimated to vary between 30-200 mg per day. Hence, in the 2 day camp period the total average soil ingested was 60-400 mg per day, resulting in an *E.coli* O157 dose of between 4-24 organisms.

- 3.28 This kind of quantitative risk assessment could be used, it was said, to organise and analyse scientific information to estimate the probability (and severity) of an adverse event; and could include hazard identification, exposure assessment, hazard characterisation and risk characterisation. The University of Aberdeen aimed to develop this study to achieve a model which would determine the probability of infection from ruminant faeces and pasture land. By varying the inputs they were able to gain a sense of validity of their assumptions. Figures 3.3 and 3.4 below, for example, **demonstrated that, using the same conditions as found at the New Deer outbreak, the probability of infection decreased significantly when pasture was left fallow for 21 days prior to an event and where faeces were removed before the event began. This underpinned our interim guidance on recreational use of animal pasture (Annex 7).**

Figure 3.3



E.coli O157 build-up at the New Deer

* Number of *E.coli* O157 organisms per gram of soil

Figure 3.3 above indicates the levels of *E.coli* O157 isolated from the soil and the length of time it took for the levels to decrease to minimal numbers.

Figure 3.4

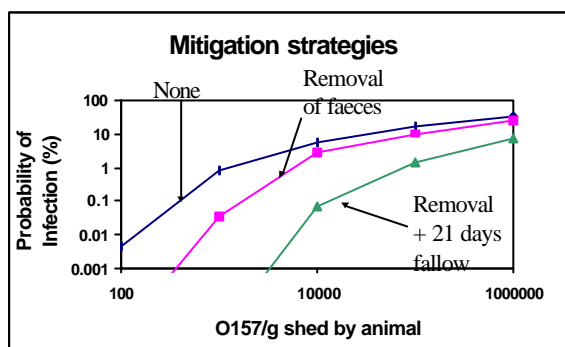


Figure 3.4 above demonstrates the probability of infection dependant on the numbers of organisms being excreted by cattle. This table clearly shows the probability of infection decreases, as the number of organisms being excreted decreases, and with the removal of faeces and removal of animals 21 days prior to an event.

3.29 The modellers made it clear that more quantitative data was required on a number of the factors in the assessment. Significantly little is known of the shedding levels of ruminants in Scotland, in particular in relation to sheep. They advised that the dynamics of *E.coli* O157 within herds/flocks were still not well understood and there was a need for longitudinal studies. **We therefore recommended that longitudinal studies be undertaken in both cattle and sheep.**

Water Research Council Project

3.30 The second factor was the risk of contamination of water supplies. We heard evidence from the Water Research Council of work that they had done on risk assessment in relation to water pollution, leading into new work commissioned by the Food Standards Agency in early 2001, the project is to last for 2 years. Unfortunately for the Task Force work had not quite got under way on that project to allow us to have any preliminary outputs. The project manager did provide a very useful insight from past experience into the likely methodology to be adopted.

3.31 The project was to develop a risk assessment model to determine how important was food-borne transmission of *E.coli* O157 in relation to other routes of transmission.

3.32 The project would review epidemiological data from England, Wales and Scotland of transmission of *E.coli* O157 to humans through routes other than food and compare with food borne transmission. It would identify sources of loading in animal reservoirs and in the environment. It would develop also a food route risk assessment model to include both meat and dairy routes of transmission. During the 2-year contract period the work would consider a wide range of sources and routes of transmission, many of which had been part of the Task Force study in recent months.

Personal Hygiene

3.33 A third factor that took our attention particularly was that of personal hygiene in the populations and in groups. As noted in chapter 4, we were very keen to understand whether any work had been done on ages of responsibility of children i.e. ages at which children might be thought able to understand concepts of personal hygiene by teaching or by following example. This was important to us in relation to controls within institutions e.g. playgroups, nurseries, schools, and in relation to children's exposure to animal contact at events such as organised farm visits. We were disappointed to find no evidence of past work despite a large amount of assistance, for example, by contact with infection control nurses within the National Health Service Scotland and through a literature search carried out for us by the Royal College of Physicians. Unfortunately, therefore, we were not able to make particularly well informed judgements about critical thresholds for such activities. Because of the evidence of infection and death at ages under 5 we set our threshold, e.g. for testing and analysis of stool samples, at 10 years of age and under. **We recommended that the SEHD commission research on ages of responsibility of children.**

What is the risk to the public from *E.coli* O157 infection?

3.34 *E.coli* O157 infection is not a common illness. In Scotland there was an annual average of 237 cases notified to the Scottish Centre of Infection and Environmental Health in the period 1998-2000. This gives a rate of 4.6 per 100,000 population (i.e. approximately one in 25,000 of us will be diagnosed as having *E.coli* O157 infection in a year).

3.35 ***E.coli* O157 infection is therefore a serious infection but not common. However, the Task Force considered it to be an important risk to public health because:**

- **A significant proportion of those affected are children (44% of sporadic cases in Scotland are aged less than 10 years old);**
- **Over half of diagnosed cases are admitted to hospital;**
- **A significant proportion of those infected suffer serious complications (10% or more);**
- **There is no recognised specific treatment for the infection;**
- **It has the potential to spread very quickly and cause major outbreaks as was seen in Wishaw in 1996**

3.36 Obviously there is a contrast between the organism being so common in the guts of sheep and cattle and yet the number of cases being relatively low. Reasons for this are explored in the following chapters.

How can we reduce the risk of being infected?

3.37 We judged it important that understanding of risks contributed to

- design of controls over sources or risk, or
- barriers between the population and exposures to risk or
- education/communication to allow all to play their parts in avoidance or minimisation of risk.

- 3.38 Where, as here, responses to a hazard are designed to be proportionate to the risk, there can be a sensitive graduation of actions. Communities could protect themselves by eg. good personal hygiene. National guidance could support agencies and Local Authorities. Regulation came into play where the foregoing approaches were perceived to be inadequate to meet the risks. In this way all sections of the population could play their parts in avoidance or minimisation of the risk. Sometimes actions by several parties could collectively create a significant barrier or control; or several actions by a single party could likewise give significant protection.
- 3.39 In the following chapters we describe the main means for managing the risk of each of the major types of exposure as described in paragraph 3.20. In broad terms, the Task force grouped risk management methods into three types:

Education/Communication

- 3.40 An extension of risk communication, this is frequently carried out piecemeal, topic by topic, where effort can be directed towards specific problems/issues. **From the contributions made to the Task force, we recommended:**
- **the need to give priority to relatively simple messages which could make a significant improvement in our protection from risk**
 - **that such messages need to be tailored very carefully to suit the target audiences and generally have to be reiterated at regular intervals**
 - **that advice needs to be set in a picture sufficiently wide to allow the non-specialist to appreciate the way in which factors interact e.g. cattle with camping, holiday cottages with private water supply. The PEPFAA code (see below) does this well. Others are needed e.g. education/child care, public health/recreation**

Formal Guidance

- 3.41 Codes of Practice, industry guides, etc., tend to be created in support of formal, legislative schemes and/or to provide guidance in manageable and helpful terms based sometimes upon legal, scientific or technical requirements. Good examples are written clearly with good illustrations and helpful cross-references to other relevant material. Such documents rarely have the force of law and can be lacking in punch where there is not a collective will to adopt them in practice.

Regulation

- 3.42 Here requirements are set in law, placing obligations on appropriate parties, duty of supervision or enforcement upon other parties and description of offences and penalties for non-compliance. Frequently external forces drive regulations e.g. requirements from acts of parliament or from EU legislation. In such cases scope for tailoring legislation proportionately to risk may be restricted. **We recommended that guidance should interpret the legislation and not lessen its impact.**

Factors in Comparisons and Risk Response

- 3.43 Decisions upon the appropriate management method were based on considerations of **practicability** and **proportionality**.
- 3.44 Solutions must be **practical** in the sense that it must be possible to put them into effect and also they must have the desired result. Solutions must also be **proportionate** to the risk being met. Hence, it could be possible to regulate those activities which effectively control the risk while leaving other activities to guidance. Guidance might be proportionate also where inter-related activities are controlled to an extent by separate pieces of legislation and some means was required to bring together the component parts coherently. We thought that the PEPFAA Code was a good example of this arrangement.
- 3.45 In some circumstances it might be possible to put a financial value on the **benefits** of this management as opposed to the **cost** of implementation. In other circumstances a comparison between cost of different types of activity or between related component parts of a large operation might be useful.

SUMMARY OF RECOMMENDATIONS

- **That longitudinal studies be undertaken in both cattle and sheep.**
- **SEHD commission research on ages of responsibility of children**
- **The need to give priority to relatively simple messages which could make a significant improvement in our protection from risk**
- **That such messages need to be tailored very carefully to suit the target audiences and generally have to be reiterated at regular intervals**
- **That advice needs to be set in a picture sufficiently wide to allow the non-specialist to appreciate the way in which factors interact e.g. cattle with camping, holiday cottages with private water supply. The PEPFAA code does this well. Others are needed e.g. education/child care, public health/recreation**
- **That guidance should interpret the legislation and not lessen its impact**

CHAPTER 4

1. DIAGNOSIS, TREATMENT & CARE

2. PUBLIC HEALTH MANAGEMENT

In this Chapter we:

- Consider those who had been or, continue to be affected or who might be infected by *E.coli* O157 in the future
- Review current practice and suggest actions to improve the care and support which they receive
- Review arrangements for the management of public health

WHAT THE PROBLEMS ARE

- 4.1 Infection by *E.coli* O157 is relatively rare. It averages around 250 cases per year in Scotland. However, its principal symptom, diarrhoea, is a very common symptom of other intestinal infections, making it difficult to distinguish *E.coli* O157.
- 4.2 If we are to learn from the past cases of infection by *E.coli* O157 we needed to deal with issues such as
 - Existing information networks might not adequately assist the public and GPs to appreciate or distinguish potential *E.coli* O157 from more general symptoms
 - Existing protocols might not adequately highlight for laboratories those cases where there was a high index of suspicion of *E.coli* O157, hence a need to confirm/eliminate presence of low numbers of organisms
 - The needs of patients, carers and families may not be understood adequately or publicised
- 4.3 From our analysis we concluded that the high risks factors were:
 - State of health, level of immunity
 - Age. The statistical evidence shows that young children and elderly people are significantly at risk and need priority
 - Location in Scotland, and particularly in Grampian
- 4.4 Our thinking was much influenced by the need for practical solutions. Those seem to lie in
 - Guidance to health professionals through guidelines or protocols
 - Information networks to and among patients, carers, and families to improve understanding, appreciate common problems and reduce isolation
 - Improved clinical and laboratory surveillance and further research
- 4.5 We detected differing views, between the medical profession and the carers, of the level of awareness of *E.coli* O157 among doctors (especially GPs). It was argued that publicity in recent years (particularly following the Central Scotland outbreak) had raised the profile of *E.coli* O157 in GPs' minds. Yet the harrowing reports of just one or two cases showed the potential for misdirection or misdiagnosis among routine gut

symptoms such as diarrhoea. All shades of opinion acknowledged the difficulty of identifying the few *E.coli* O157s in a steady stream of routine diarrhoeal cases.

WHAT WE DON'T KNOW

- 4.6 As mentioned in Chapter 2 “Setting the Scene”, we don’t know:
- The full number of cases of *E.coli* O157 infection, including those infected, who did not attend their GP for diagnosis or were not diagnosed. Haemolytic Uraemic Syndrome Help (HUSH) suggested that under-reporting of cases might conceal around a further 30% of the currently known numbers of infection. The risk of under reporting had to be borne in mind. However, a major study of people with gut infections conducted in England (the IID study) did not reveal any unidentified infections
 - Why incidence was different in different geographical areas e.g. Grampian (high) vs Glasgow (low)
 - The ways in which the organism was evolving. As is stated in Chapter 2 “Setting the Scene”, the genetics of the organism were beginning to be understood but we were still only at the frontier of this work
 - The progress of individual cases over time. It seemed that patients suffered effects in very individual ways and we needed to be able to feed back our understanding of these situations into improved care. More is said under “surveillance” below

WHAT CAN BE DONE

1. DIAGNOSIS TREATMENT & CARE

Diagnosis

- 4.7 The presentations and discussion of this topic quickly focussed on the patient’s need for early diagnosis and the back-up requirement of clinical laboratories. Initially it was thought that speed of diagnosis was of lesser importance where an effective treatment was not available. Further work for us by doctors involved in the Central Scotland outbreak highlighted, by contrast, the importance of rapid and effective laboratory diagnostic protocols in support of well-informed awareness of *E.coli* O157 complications.
- 4.8 The doctors highlighted for us possible predictors of severe infection by *E.coli* O157
- High risk age groups
 - Up to 10 years
 - Greater than sixty years of age

OR in all ages

- Clinical features independently associated with *E.coli* O157 compared with other enteric pathogens
 - History of bloody diarrhoea
 - Visibly bloody stool specimens
 - Abdominal pain
 - Abdominal tenderness upon physical examination

– Elevation in peripheral white cell count

- 4.9 They further pointed to possible predictors for the development of Haemolytic Uraemic Syndrome (HUS) from *E.coli* O157 infection which are listed below. In 10-15% of cases, those predictors may emerge between 3 and 14 days following onset of diarrhoea (median 6 days)
- Vomiting
 - Fever
 - Elevated peripheral white cell count
 - Elevated serum CRP¹
- 4.10 From the patient and carer point of view, early diagnosis was crucial. With the benefit of hindsight, it was tempting to be critical of past experiences. The horrific image of a family left to struggle with a child suffering from undiagnosed kidney failure presented us with an object lesson. Such real life cases pointed up even more sharply than before the essential need to promote education and clinical practices which prevented or minimised the risk of cases ever reaching such a stage undiagnosed.
- 4.11 In relation to the part a patient or carer might contribute toward early diagnosis, patient support groups suggested to us that it might be helpful for the parent or carer to take a faecal sample on a first visit to the doctors. There were reservations that needed to be addressed about the availability of appropriate sample containers within the 48 hour period e.g. surgeries or pharmacies closed during evenings or weekends. **We concluded that patients or carers should seek advice at the first contact with the doctor, pharmacist, NHS 24 etc about arrangements for providing a stool sample.**

Our recommendations on diagnosis were

- 4.12
- **Where diarrhoea persists for more than 48 hours, a patient should seek advice of a doctor or appropriate health professional**
 - **Where diarrhoea was bloody, a patient should immediately consult the doctor and a GP should immediately be thinking about *E.coli* O157**
 - **The GP should obtain an early stool sample for submission to a laboratory to confirm or eliminate *E.coli* O157**
 - **In conjunction with recommendation at paragraph 4.34, NHS Scotland should develop advice which should include guidance on the circumstances in which a patient should seek early medical advice e.g. type and duration of symptoms and in which a GP requests a specimen**
- 4.13 To have any prospect of success in practice, **we recommend that stool samples from the high-risk groups or those with clinical features identified in paragraph 4.8 above should be submitted.** To attempt to go beyond this and to sample more widely (e.g. in all diarrhoeal cases) would, we believed, detract from the interests of the high-risk (potential *E.coli* O157/HUS) patients and diminish the probability that the proposed regime would be effectively implemented. This accords with past recommendations on widespread sampling for *E.coli* O157 detection by ACMSF and the Pennington Report.

¹ C-Reactive Protein – a non-specific indicator of infection.

- 4.14 **We recommended that NHS Scotland should develop a concerted and consistent educational campaign targeting the public, health and other relevant professionals.**
- **To increase awareness of the need for early diagnosis**
 - **To reduce the risk of person to person spread**
 - **To facilitate therapeutic intervention as early as possible**

Should All Clinical Laboratories Routinely Examine all Diarrhoeal Stools for *E.coli* O157

- 4.15 The ACMSF and the Pennington Group had recommended that all diarrhoeal stool samples submitted to clinical laboratories for testing should be examined for *E.coli* O157. Work published as we were commencing our study suggested that these recommendations, were implemented differently across Scotland. The study had aimed to investigate current laboratory practice with regard to examining diarrhoeal stools for the presence of *E.coli* O157 and to investigate the public health management of identified cases of potentially Verocytotoxin producing *E.coli*.
- 4.16 All 29 diagnostic laboratories responding to this 1998 survey confirmed that they tested stool specimens for *E.coli* O157. Twenty seven of them tested **all** stools for *E.coli* O157 in line with the ACMSF and Pennington recommendation: the remaining 2 used other clinical and age-related criteria for selective testing.
- 4.17 **We were encouraged by this finding and recommended that the need for testing all diarrhoeal samples for *E.coli* O157 and for referring all *E.coli* O157 isolates to the National Reference Laboratory (SERL) should be formalised in diagnostic laboratories protocols.**
- 4.18 **The Task Force further recommended that where the index of suspicion of *E.coli* O157 infection is high and initial testing is negative, further, more sensitive testing should be carried out by the Reference Laboratory.**

Direct Culture vs Immunomagnetic Separation (IMS)

- 4.19 Discussion of the circumstances of paragraph 4.18 (tests negative but suspicion high) and considerations of the nature and evolution of *E.coli* O157, led to a debate regarding the relative merits of traditional direct culture and the new IMS techniques. This was resolved through an exchange of papers among some people involved with the Central Scotland Outbreak and the Scottish *E.coli* Reference Laboratory (SERL), Edinburgh.
- 4.20 It was agreed from that exchange that during the acute diarrhoeal phase of *E.coli* O157 infection organisms might be present in large numbers in the faeces and would be readily isolated by direct culture on appropriate selective media. It was noted also that the number of organisms in the faecal sample declined rapidly after the first few days of infection. The number of organisms available for detection would therefore be relatively few by the time the diarrhoea symptoms were passing and complications such as HUS might be developing. We were advised of some media enrichment techniques which detect lower numbers of organisms. Some of these such as modified TSB are recommended in specific situations by the PHLS.

- 4.21 We noted recent Guidelines for England and Wales by the Public Health Laboratory Service (PHLS) for the control of infection with *E.coli* O157. Those guidelines noted that direct plating methods might be unsuccessful when specimens were obtained 4 days or more after the onset of symptoms and, in particular, by the time that HUS or TTP had developed. The paper noted a potential 15% increase in detection rate in primary cases by means of enrichment culture and perhaps 30% improvement in relation to convalescent patients and family contacts. The guidelines noted the value of both enrichment culture and immunomagnetic separation techniques in the investigation of outbreaks.
- 4.22 It was suggested by SERL that a 10 to 100 fold increase in sensitivity of detection might be achieved by using IMS, as demonstrated by a number of studies in the clinical, food and environmental sectors. On first consideration, the benefit of improved sensitivity was obvious in circumstances where small numbers of organisms were sought - either because of initial small numbers or through the passage of time.
- 4.23 However, although the technique was relatively simple to perform it did not lend itself readily to automation, did require some specific training in the protocols, and did carry the possibility of cross-contamination of samples with the risk of generating false positive results.
- 4.24 The Task Force concluded that, at the current state of development, direct culture methods would continue to be appropriate in the early stages of suspicion/confirmation/elimination of causal organisms, when the counts were likely to be relatively high. It was further agreed that the main role of the IMS technique in the clinical setting was likely to be in the investigation of late-presenting disease, or as mentioned above, where clinical suspicion of *E.coli* O157 infection is high in the face of negative conventional cultures. **The Task Force recommended the following criteria for the use of IMS technique**
- **Any case of HUS or TTP in which conventional culture had failed to yield a pathogen**
 - **Any case of a bloody diarrhoea stool in which conventional culture had failed to yield a pathogen and more than 4 days had elapsed between the onset of diarrhoea and obtaining a stool sample**
 - **Any patient of less than 10 years of age or over 60 years of age with diarrhoea from whom conventional cultures has failed to yield a pathogen and more than 4 days had elapsed between the onset of diarrhoea and obtaining a stool sample**
 - **Any contacts of a case or an outbreak-associated case with diarrhoea from whom conventional culture had failed to yield a pathogen**
 - **Any asymptomatic² contacts of a case or an outbreak-associated case from whom conventional culture had failed to yield a pathogen but who were in a high risk group, i.e., under 10 years, over 60 years**
 - **These stools should also be examined for the presence of non-O157 VTEC by IMS, for organisms for which this technique is available**

² Where the person infected does not suffer any resulting symptoms or disease

Review of Testing Techniques and Molecular Genetics

- 4.25 We were briefed on the development of a diagnostic kit for detecting *E.coli* O157 (and a range of other pathogens). Results of tests were to be matched to standards provided on the internet. This was claimed to give rapid detection times and freedom from specialist staff training and from interpretation issues.
- 4.26 Given the rapid pace of change in relation to genetics, detection and typing techniques, the Task Force **recommended to NHS Scotland that a procedure be established for on going review of conclusions of our report in relation to new knowledge and emerging diagnostic techniques.** A group charged with such a responsibility could also assess and advise on the introduction of new clinical microbiological techniques applicable in other areas.

Treatment

- 4.27 Whether a case is sporadic or part of an outbreak, the patient was central. We were advised that there were no known treatments for stopping the infection. We have noted above under ‘diagnosis’, the possibility of some predictor symptoms which might allow treatments to be initiated and discussed with the patient, family or carers. Routinely this would include administration of fluids and pain management: the patient support groups emphasised to us the individuality of each case. Early diagnosis was also thought to stand a greater chance of avoiding the use of treatments inappropriate in the case of *E.coli* O157. See paragraphs 4.28-4.29 below

Antibiotic and Antimotility Therapy

- 4.28 There was some discussion within the Task Force about the propriety of administering antibiotics in cases of *E.coli* O157 or potential *E.coli* O157 infection. There had been some debate in recent years on the risk of HUS/TTP being increased or decreased by such treatment. The controversy revolved around 3 leading case studies:

A study of 278 children younger than 16 years who developed culture-confirmed *E.coli* O157 infection during the 1993 Washington State Jack-In-The-Box outbreak failed to demonstrate a difference in the occurrence of HUS among those who had been given antibiotics compared to those who had had no treatment for their enteritis.

By contrast, in the 1996 outbreak of *E.coli* O157 infection in Sakai City in Japan, administration of Fosfomycin³ to affected patients within 3 days of the onset of the diarrhoea reduced the risk of HUS. The risk assessment in this case was based on a comparison of patients treated with Fosfomycin with patients treated with other antibiotics. A comparison with untreated patients would have been more helpful.

³ An antibiotic

However, in a more recent study of 71 sporadic cases between 1997 and 1999, an analysis showed that children treated with antibiotics had a higher risk of HUS than children who received no antibiotics.

We concluded that the balance of evidence is against the use of antibiotics in cases of *E.coli* O157 or potential *E.coli* O157 infection. We recommended that guidance on this topic should be reconsidered by NHS Scotland.

- 4.29 We were advised that several studies had highlighted the risk of using antimotility agents, in *E.coli* O157 infection. Analysis of the 1993 ‘Jack-In-The-Box’ outbreak demonstrated an increased risk of HUS in patients who had been treated with specified antimotility agents within 3 days of the onset of diarrhoea. In addition this study had demonstrated that patients treated with antimotility agents who did not develop HUS, had a longer duration of bloody diarrhoea.

We concluded that use of antimotility agents in *E.coli* O157 or potential *E.coli* O157 cases should be discouraged. We recommended that guidance on this topic should be reconsidered by NHS Scotland.

Immunity

- 4.30 The Central Scotland outbreak clinicians looked also for us at the potential for immunisation against *E.coli* O157. A number of early pre-clinical and animal studies on the potential value of immunisation have suggested that a critical level of serum IgG with anti-O-specific polysaccharide activity may confer immunity. Most adults have negligible levels of the required antibodies to *E.coli* O157. As a first step in the potential development of a vaccine tests on 87 healthy adult volunteers suggested that a four fold increase in IgG LPS antibody titres was achieved in 81% in 1 week and 100% after 4 weeks. However it is not known if such antibodies protect against enteric infections after subsequent exposure. **We concluded that work in this area was at too preliminary a stage to make recommendations in the value of vaccination at present, even if available.**

Management in General Practice and in the General Hospitals

- 4.31 Although we have been closely advised on technical aspects and realities of the treatment of patients by those close to past and current cases, we needed to test our thinking on a much wider net within the Health Service in Scotland and gain a better feel for the mechanisms that we might use to put our thinking into practice. We have been in contact with:-

The Royal College of General Practitioners in Scotland
The Royal College of Physicians in Scotland
The Royal Pharmaceutical Society
The Clinical Standards Board for Scotland and
The Scottish Infection Strategy and Standards Group.

- 4.32 We found that the work of these bodies was sometimes separate from their formal functions and sometimes linked where “intercollegiate” networks had been established to pursue topics of common interest or to avoid unhelpful barriers to collective

thinking. We thought it interesting also that where formal processes would have taken much time to pursue, the working networks seemed to be geared to the faster pace of change on the ground. Our aim was to bring our thinking to them before it was finalised so that:

- Our conclusions could be focussed on what was practical; and
- The bodies and their networks could consider how to participate in the implementation of our findings

4.33 Under the general heading of ‘clinical standards’ we sought their support in the establishment of clinical guidelines on sampling, testing, diagnosis and treatment. Perhaps even more important than those, however, is the whole question of education and communication. We will deal with this in its own right later in this report; but much already written in this chapter hinges around a raising of awareness of:

- The nature of *E.coli* O157 and the conditions that it could cause;
- About the need to be vigilant for events and symptoms that might occur only rarely; or
- Finding the best means of making a suitable communication with each of the groups involved - the public, patients/families/carers, doctors, laboratory staff, nurses, health visitors, voluntary bodies, and statutory agencies

4.34 **Our recommendations for management in general practices and in general hospitals were**

- **Creation of clinical guidelines on management of *E.coli* O157 and complications through formal networks e.g. Scottish Intercollegiate Guideline Network (SIGN), Clinical Standards Board for Scotland (CSBS), the Scottish Infection Strategy and Standard group and by more specific initiatives**
- **Creation of education initiatives for health professionals and related interests and for the public on *E.coli* O157 and complications**

Care

4.35 We interpret this heading broadly to include work directly with the patient and carers but also more general support in the form of understanding, appreciation of need for information and communication. We were much impressed by the evidence of the patient support groups concerning the persistent difficulty experienced by patients/carers individually according to their needs. Neither the unfamiliarity of a sporadic case nor the emerging themes of an outbreak seemed to offer a particular advantage in this respect. We were inspired by the efforts of the support groups to generate networks that they thought would be helpful to others finding themselves in a similar situation; and to produce literature giving the kind of advice they would hope to have had available when their experience was new and terrible. It was impressed upon us that helplines, websites and networks intended to give access and dispel feelings of isolation can be very valuable. At the same time, the needs of those suffering different symptoms from *E.coli* O157 may not have much in common e.g. kidney failure or brain damage.

4.36 **Also included in our vision of ‘care’ is a recommendation to improve communication about illness to sufferers and their families, involving appropriate**

vocabulary, thoughtful targeting and relevant presentation. We have more to say on this topic in Chapter 10 'Education and Communication'.

2. PUBLIC HEALTH MANAGEMENT

- 4.37 In this section we considered the functions commonly led in Scotland by public health professionals working in Health Boards, Local Authorities and SCIEH. The functions were:
- The prevention of person to person spread;
 - The surveillance of the infection in people;
 - The management of outbreaks

Person to Person Spread

- 4.38 We took the view that this was one area where action by individuals and organisations, could make a significant impact in reducing or eliminating spread of infection and secondary cases.
- 4.39 The initial requirement, of course, was to know that the primary case exists, by means of early reporting and good clinical practice in diagnosis and testing. Such testing would include close contacts to eliminate them from suspicion or to initiate further tests or treatment.
- 4.40 We had strong representation from the patient support groups on the need to make best use of any opportunity to prevent person to person spread in the home and in institutions, especially those where children come together. The leaflets and posters published and distributed by the Heather Preen Trust give brief, simple and easily read advice about the handling of potential cross contamination in the home. We found their advice on the washing of hands, use of disinfectant, wearing of gloves for handling contaminated clothes - all practical and sensible. HUSH likewise have made contact widely with material ranging from comprehensive leaflets to child-targeted posters.
- 4.41 We tried to understand better the particular situation of institutions dealing with young children i.e. younger than school age such as nurseries. We were advised to include in this category a range of less formal settings, such as playgroups, mother and toddler groups, holiday/after-school/lunch clubs etc. We saw the problem in these settings arising from
- Close personal contact between the children and between children and adult supervisors and parents
 - The uncertainty/range of ability of children at these ages to appreciate the need for personal hygiene, at its simplest, handwashing
 - The difficulty for some parents/carers of maintaining infected children at home, at least not within the institution, and/or the pressure in such circumstances to return children to the institution before they are clear of infection
 - Where children are returned before they are clear of infection, the absence of formal power to the manager of the institution to exclude a child exhibiting symptoms in a pre-school setting (compare the power of a Head Teacher to exclude in similar circumstances)

- 4.42 Managers of such institutions are unlikely to have the authority to exclude a child on health risk grounds. Such powers are held by head-teachers in primary schools and secondary schools. This is anomalous and **we recommended that consideration should be given to allow for the exclusion of a child on health risk grounds from nursery schools.**
- 4.43 Handwashing was mentioned above. We make no apology for returning to this item. The fact remains that *E.coli* O157 can be removed (and person to person spread reduced) by attention to the washing of hands with running water (preferably warm), soap and clean or disposable towels. In the case of a family affected by a case of *E.coli* O157 infection or in close contact with one, it would be important to implement a number of controls which collectively give significant protection, e.g. cleaning, disinfecting and not to share towels with any of the affected parties. This message had been repeated many times but we considered it remained valid and we would wish it to be repeated time and time again.
- 4.44 **To minimise person to person spread we recommended to NHS Scotland that**
- **Personal hygiene should be promoted generally**
 - **The importance of handwashing to the public and the staff of institutions including hospitals, nurseries, playgroups etc. be publicised at regular intervals**
 - **Our preliminary work in relation to ages/thresholds of competence in matters of personal hygiene should be taken further, for example by infection control nurses, and information leaflets produced**
 - **Use of hygiene facilities should be promoted within high risk groups e.g., children under 10 years of age within schools, nurseries, playgroups etc., visiting open farms or camping on agricultural land**
 - **Hygiene for families/groups affected by *E.coli* O157 infection should be promoted via available literature**
 - **All contact siblings under 5 should be excluded as a condition of licensing of nurseries and other education/social work facilities**

Surveillance

- 4.45 Although surveillance⁴ was of lesser immediacy than issues such as diagnosis or treatment, it was necessary to ensure that laboratory data, outbreak data, etc., is available to improve strategic planning of services and preventative efforts. **We recommended the introduction of a standardised enteric disease surveillance form** for use among all Local Authorities and Health Boards throughout Scotland perhaps drawing on the existing PHLS form. HUSH encouraged standardisation of surveillance systems throughout the UK. Our discussions noted that the Scottish and English systems were not identical but that data from them was compatible. **We recommended the adoption of a revised Scottish Infectious Disease Surveillance System (SIDSS).**
- 4.46 The Scottish *E.coli* Register, established in 1998 was subject of a bid for renewed funding during the currency of our study. This register captured additional data on *E.coli* O157 and, if funding was secured, it would be extended to include facilities to capture laboratory surveillance for *E.coli* O157, a minimum data set, clinical data set

⁴ Monitoring the number and type of cases of infection.

and would permit the long term follow-up of cases. **The Task Force recommended the continuation of the Register.**

- 4.47 The British Paediatric Surveillance Unit (BPSU) HUS surveillance scheme was only for children under 16 years of age and has now ceased. Of the 63 cases of HUS identified by this survey in Scotland in the past 4 years, 62 had culture or serological evidence of *E.coli* O157. This demonstrated that the development of HUS in children was mostly caused by *E.coli* O157. **The Task Force recommended the creation of a surveillance system for HUS to include both children and adults.**
- 4.48 As mentioned earlier, outbreaks, although unwelcome in themselves, can provide significant data for future use or reference. **We therefore recommended that high priority was given to ensuring that outbreaks are adequately investigated, sources and outcomes traced, reports produced and copies forwarded to Scottish Centre for Infection and Environmental Health (SCIEH).**
- 4.49 We welcomed the decision of the Foods Standards Agency Scotland to fund enhanced surveillance in food. In relation to our particular interest in *E.coli* O157, the **Task Force recommended the integration of surveillance of *E.coli* O157 from human/food/animals and environmental sources, including water.**

Outbreak Management

- 4.50 In our interim report of February 2001 (Annex 7) we recommended that the Cairns Smith Group on Investigation and Control of Foodborne Disease should be reconvened to consider a number of developing issues. Some were caused by the creation of the Food Standards Agency and some identified in the cross-sectoral work of our study. The Cairns Smith Group has been reconvened and our preliminary thinking on this was communicated so that we might possibly reflect its initial thoughts in our report. **Our final recommendation to the Cairns Smith Group was to consider the following:**
- **Clarify roles and responsibilities especially at national level e.g., Designated Medical Officer, Food Standards Agency, SCIEH, EHOs**
 - **Consider need for a national SWAT team (Swift Action Team)**
 - **Consider creating a panel of national experts for outbreaks and especially food investigation**
 - **Develop protocols for food and epidemiological investigation e.g., sampling priorities, recording, liaison with food laboratories, tracing food chain, inspection required for outbreaks**
 - **Develop and standardise protocols for controlling water-related incidents**
 - **Improved co-ordination and formalised support mechanisms among neighbouring Health Boards/SCIEH/FSA**
 - **Ongoing review and development of local outbreak plans between Local Authorities, Health Boards and FSA**
 - **Consider introduction of standards and audit for outbreak management**
 - **Consider introducing formal reporting system for outbreaks and encourage formal publication of outbreak reports**

SUMMARY OF RECOMMENDATIONS

Diagnosis

- Where diarrhoea persists for more than 48 hours, a patient should seek advice of a doctor or other health professional
- Where diarrhoea was bloody, a patient should immediately consult the doctor and a GP should immediately be thinking about *E.coli* O157
- The GP should obtain an early sample for submission to a laboratory to confirm or eliminate *E.coli* O157
- NHS Scotland should develop advice which should include guidance on the circumstances in which a patient seeks early medical advice e.g. type and duration of symptoms and in which a GP requests a specimen
- Stool sampling in the high-risk groups or those with the clinical features identified should be submitted
- NHS Scotland should develop a concerted and consistent educational campaign targeting the public, medical, and paramedical services.
 - To increase awareness of the need for early diagnosis
 - To reduce the risk of person to person spread
 - To facilitate therapeutic intervention as early as possible
- The need for testing all diarrhoeal samples for *E.coli* O157 and for referring *E.coli* O157 isolates to the National Reference Laboratory (SERL) should be formalised in diagnostic laboratories protocols
- Where the index of suspicion of *E.coli* O157 infection is high and initial testing is negative, further, more sensitive testing should be carried out by the Reference Laboratory
- The IMS Technique should be used where:
 - Any case of HUS or TTP in which conventional culture has failed to yield a pathogen
 - Any case of a bloody diarrhoea stool in which conventional culture has failed to yield a pathogen and more than 4 days have elapsed between the onset of diarrhoea and obtaining a stool sample
 - Any patient of less than 10 years of age or over 60 years of age with diarrhoea from whom conventional cultures has failed to yield a pathogen and more than 4 days have elapsed between the onset of diarrhoea and obtaining a stool sample
 - Any contacts of a case or outbreak-associated case with diarrhoea from whom conventional culture has failed to yield a pathogen
 - Any asymptomatic contacts of a case or outbreak-associated case from whom conventional culture has failed to yield a pathogen and who are in a high risk group, i.e., under 10 years, over 60 years
 - Stool samples should also be examined for the presence of non-O157 VTEC for organisms for which this technique is available
- NHS Scotland should establish a procedure for on going review of conclusions of our report in relation to new knowledge and emerging techniques

Treatment

- Guidance on the use of antibiotics in cases of *E.coli* O157 or potential *E.coli* O157 infection should be reconsidered by NHS Scotland

- **Guidance on the use of antimotility agents in *E.coli* O157 or potential *E.coli* O157 cases should be reconsidered by NHS Scotland**
- **Creation of clinical guidelines on management of *E.coli* O157 and complications through formal networks e.g. Scottish Intercollegiate Guideline Network (SIGN), Clinical Standards Board for Scotland (CSBS), the Scottish Infection Strategy and Standard group and by more specific initiatives**
- **Creation of education initiatives for health professionals and related interests and for the public on *E.coli* O157 and complications**

Care

- **Improve communication about illness to sufferers and their families, involving appropriate vocabulary, thoughtful targeting and relevant presentation**

Public Health Management

Person to Person Spread

- **Consideration should be given to allow for the exclusion of a child on health risk grounds from nursery schools**
- **Personal hygiene should be promoted generally**
- **The importance of handwashing to the public and the staff of institutions including hospitals, nurseries, playgroups etc., be publicised at regular intervals**
- **Our preliminary work in relation to ages/thresholds of competence in matters of personal hygiene should be taken further, for example by infection control nurses, and information leaflets produced**
- **Use of hygiene facilities should be promoted within high risk groups e.g., children under 10 years of age within schools, nurseries, playgroups etc., visiting open farms or camping on agricultural ground**
- **Hygiene for families/groups affected by *E.coli* O157 infection should be promoted via available literature**
- **All contact siblings under 5 should be excluded as a condition of licensing of nurseries and other education/social work facilities**

Surveillance

- **Introduction of a standardised enteric disease surveillance form**
- **Adoption of a revised Scottish Infectious Disease Surveillance System (SIDSS)**
- **Continuation of the *E.coli* Register**
- **Creation of a surveillance system for HUS to include both children and adults**
- **High priority is given to ensuring that outbreaks are adequately investigated, sources and outcomes traced, reports produced and copies forwarded to Scottish Centre for Infection and Environmental Health (SCIEH)**
- **Integration of surveillance of *E.coli* O157 from human/food/animals and environmental sources, including water**

Outbreak Management

- **The Cairns Smith Group should consider the following:**
 - **Clarify roles and responsibilities especially at national level e.g., Designated Medical Officer, Food Standards Agency, SCIEH, EHOs**
 - **Consider need for a national SWAT team**
 - **Consider creating a panel of national experts for outbreaks and especially food investigation**
 - **Develop protocols for food and epidemiological investigation e.g., sampling priorities, recording, liaison with food laboratories, tracing food chain, inspection required for outbreaks**
 - **Develop and standardise protocols for controlling water-related incidents**
 - **Improved co-ordination and formalised support mechanisms among neighbouring Health Boards/SCIEH/FSA**
 - **Ongoing review and development of local outbreak plans between Local Authorities, Health Boards and FSA**
 - **Consider introduction of standards and audit for outbreak management**
 - **Consider introducing formal reporting system for outbreaks and encourage formal publication of outbreak reports**

CHAPTER 5

ANIMALS & ENVIRONMENT: UNDERSTANDING THE HAZARD

In this Chapter we:

- Consider animal sources of *E.coli* O157
- Describe past work and conclusions on prevalence of the organism
- Consider factors affecting the shedding of *E.coli* O157
- Discuss possible interventions to reduce *E.coli* O157 levels in animals

5.1 The case control studies carried out in Scotland, in England and in Wales from 1996 – 1999 (see paragraph 2.35) clearly demonstrated that cases of *E.coli* O157 were now caused more frequently through infection from environmental sources such as visiting farms, and contact with animals and animal faeces than from food sources.

***E.COLI* O157 IN ANIMALS**

5.2 *E.coli* O157 had been identified in a wide range of animals in many parts of the world. Cattle were first identified as carriers of *E.coli* O157 in the USA and Canada in 1986, although the organism was first isolated in calves in Argentina sampled in 1977 before the agent was associated with disease in man. The first detection in cattle in England was in 1989 and in Scotland in 1992. In the 1990s the organism was detected also in cattle in Germany, Austria, Japan, Switzerland, and Norway. Sheep had also been identified as a source of the organism in Australia, USA, and Great Britain. The organism had also been identified from goats, from farmed deer in the UK and from wild deer sharing range land with cattle (in the USA).

5.3 Although surveys of pigs until recently had found only non-verocytotoxin producing O157s, recently VT producing O157s had been found in a small proportion.

5.4 The organism had been isolated from other domestic animals, for example, horses and dogs (especially greyhounds) and from zoo animals, including primates. The organism had not been found naturally in poultry, but domestic geese and some turkeys had been found to be infected. Seagulls, house flies and fruit flies had also been found to carry the organism. A recent case reported of the same organism isolated from a child and that of a dog.

5.5 Although *E.coli* O157 is the organism most usually associated with HUS in humans, especially children, there was little evidence that *E.coli* O157 caused clinical disease in animals. We understood that some studies had been carried out to identify if *E.coli* O157 could be pathogenic in cattle but where high doses were administered to young animals.

5.6 **From the foregoing evidence, the Task Force formed a preliminary conclusion that the main source of infection from *E.coli* O157 was from a reservoir in ruminant animals, principally cattle and sheep.**

Early Prevalence Study

- 5.7 Although the organism had been identified with a source in cattle since 1986, the extent to which herds and flocks were affected was not well understood even as recently as 1997. A study in an abattoir in Sheffield in 1993 found 4% of cattle to be carriers. In 1996 only 0.25% of samples were found to be positive out of more than 5,000 bovine samples submitted to veterinary investigation laboratories throughout Scotland. A later similar study in England and Wales using a more sensitive technique found 0.83% of bovines positive, and a study at Sheffield abattoir identified 15.7% of the cattle to be carriers. However, methods varied across this early work and differences in positive results cannot automatically be ascribed to trends in the prevalence of *E.coli* O157.
- 5.8 Following the major food-borne outbreak in central Scotland in 1996 and the Report of the Pennington Group which followed in April 1997, research was commissioned into the prevalence of *E.coli* O157 in Scottish beef cattle and into factors influencing the shedding of the organism in beef suckler cows.

The Scottish Prevalence Study (1998 – 2000)

- 5.9 The major purpose of this study was to determine the group level prevalence of verocytotoxin producing *E.coli* O157 in fattening cattle in Scotland. Given the uncertainties from past work this research carefully refined the methods on the sampling frame to be used, so that subsequent comparisons and trends would be meaningful. Some 14,500 faecal samples were collected from over 950 farms between April 1998 and May 2000. Animals were aged between 12 and 30 months, and the nearest cohort to slaughter on any farm was selected. From the results of this and other work published in June 2000, the Task Force noted the following key findings.
- 5.10 While concluding that the prime source of *E.coli* O157 was in ruminant farm animals, we accepted nonetheless that the reasons for this occurrence continued not to be well understood. Similarly, there was no certainty about the reasons for the transient occurrence of the organism within the animal population. Infection from poorly made silage had been suggested; as had contamination of feed and replication of *E.coli* O157 in wet grains and silage/corn mixes. We had already noted above that restocking from external sources offered a higher risk of infection than from breeding within the herd.
- 5.11 Of course, cross-contamination from other animals was clearly possible, including others of the same species, even within the same herd; from other species; and from wild animals (including deer, if they graze the same pasture). Cross-infection had also been shown from wild birds, especially seagulls and other scavengers which might spread the organism from human sewage or refuse tips to pasture or to farms. From the evidence presented to us there appeared to be little risk to the public from birds, although other *E.coli* serotypes, which can be pathogenic to man, had been isolated from dead finches around bird tables.
- 5.12 Given the current state of knowledge in these areas, **we concluded that for practical purposes, we should assume that *E.coli* O157 may be present in all ruminants, with particular emphasis, obviously, on the major species, cattle and sheep.** While we had reasonable evidence of some factors affecting prevalence of the organism in the animal population, as discussed below, the low infective dose and erratic prevalence of

E.coli O157 suggested that factors affecting prevalence in the animal population such as animals at grass, provided only limited relief from the risk from this organism.

- **Animal-level prevalence:** **8% of cattle shedding *E.coli* O157**
- **Group-level prevalence:** **23% groups of cattle having at least one shedding animal**

- 5.13 Analysis of the shedding rates on individual farms had shown that there were statistically significant differences between farms where the animals were housed when sampled, and those farms when the animals were at grass - typically higher amongst housed animals. However the shedding rates of the housed animals was seen to drop significantly during winter months, increasing again the subsequent Spring. Housed animals also showed a fall in shedding rate over the period of study. No similar trend was observed in cattle at grass, either seasonally or over the period of study. Overall, some 10% of housed cattle and 5% of cattle at grass were found to be shedding *E.coli* O157. Work carried out in Denmark, Canada and the USA also showed that cattle tend to excrete higher numbers of *E.coli* O157 in late spring, summer and autumn. Overall, some 10% of housed cattle and 5% of cattle at grass were found to be shedding *E.coli* O157. Analysis is ongoing to try to tease out the factors that may give rise to the seasonal patterns of shedding.
- 5.14 In relation to the presence or absence of shedding, farms which re-stock from external sources were shown more likely to be positive, than those which stocked from breeding within the herd. No change in presence/absence in herds was detected over the study period.

England & Wales Prevalence Study (1999)

- 5.15 A further study on-farm to determine the prevalence of faecal excretion of *E.coli* O157 in cattle was carried out on randomly selected farms in England and Wales between June and December 1999. *E.coli* O157 was found in 4.7% of individual animals and in 44% of the herds. In the infected herds an average of 10.2% of individual cattle were excreting *E.coli* O157. Excretion was associated with age and was greater in cattle under 24 months and greatest in cattle under 2 months of age. Cattle in fattening herds were twice as likely to excrete *E.coli* O157 than those in dairy or suckler herds, even allowing for the age of the cattle.

Prevalence at Slaughter in Great Britain (1999)

- 5.16 Notwithstanding regional or species-specific studies in parts of the country, prior to 1999 no national survey at farm or abattoir had been conducted across the UK. In consequence, two 12 month abattoir studies were carried out from January 1999 - in cattle, sheep, and in pigs. *E.coli* O157 was found in this survey to be present in the faeces of 4.7% of the cattle, 1.8% of the sheep and in 0.16% of the pigs slaughtered in Great Britain for human consumption. In the cattle and sheep survey, faecal carriage was detected throughout the year, but was greatest in the Summer in both species, and least in the Autumn in cattle and in the Winter in sheep. *E.coli* O157 was detected in animals slaughtered throughout GB, but there was a significantly greater incidence of *E.coli* O157 in cattle in abattoirs in the east of GB.

Factors Influencing Shedding in Beef Suckler Cows in Scotland (1997 – 2000)

- 5.17 In this research project 32 farms were sampled at approximately monthly intervals over at least 10 months within the project period of August 1997 to April 2000. Unlike the prevalence study described above, in this case farms were not randomly selected, but chosen to include 12 herds of known positive status.
- 5.18 As mentioned above in respect of the Scottish studies, recent work had used a standard test for isolating *E.coli* O157. However, additional work on cattle samples using more sensitive, but not fully validated, diagnostic methods demonstrated that over half of the positive samples may have failed to be detected. The evidence presented to us may be thought to suggest, therefore, that the prevalence of faecal carriage and excretion in cattle may be up to twice that reported in the three studies.
- 5.19 Six farms showed no evidence of shedding at any time. The majority (67%) of positive farms shed for less than 5 months of the year, with a significantly seasonal effect in the Spring and Autumn. The research revealed strong associations between shedding and housing, and the feeding of bought in distillers spent grains. There was also an association with the presence of flocks of wild geese on farms. There appeared to be no relationship to calving and weaning, the use of fertiliser or the spreading of manure, presence of other species of animals on the farm or the feeding of forage crops.

Factors Affecting the Prevalence of Shedding *E.coli* O157

- 5.20 As we have noted from preceding paragraphs, prevalence had been observed to relate:-
- To age, calves less than two months old shedding more than older calves, shedding more than adults
 - Housed animals shedding more than those at grass
 - Significant seasonal influences, although there is no consistent overall trend from the results of studies presented to us
 - Fattening herds shedding more than suckler or dairy herds
 - The stocking policy, herds restocked externally excreting more
 - Diet

Conclusion of Prevalence

- 5.21 The findings of the three studies, published at the Open Forum in Edinburgh in June 2000, formed a further key input in our consideration of the hazard of *E.coli* O157 from animals. They are summarised in figure 5.1 below

Figure 5.1

	SCOTLAND ON-FARM	ENGLAND & WALES ON-FARM	GB ABATTOIR
Cattle (individually)	8%	4.7%	4.7%
Cattle Herds	23%	44%	-
Sheep	-	-	1.8%
Pigs	-	-	0.16%

The age range and type of cattle tested in the Scottish and English & Welsh studies were not identical and therefore the figures cannot be directly compared

- The individual animal prevalence was similar to the faecal carriage for animals at slaughter. *E.coli* O157 was more commonly detected in calves than in adults and, independent of age, was more common in fattening herds than dairy or suckler herds
- The findings of faecal carriage and excretion of *E.coli* O157 in the three studies is similar to that reported by others in the UK and worldwide

Nutritional Effects on the Shedding of *E.coli* O157

5.22 We noted the results of several studies involving comparisons between high protein grain diets and fibre-diet rich diet of grass hay. In relation to sheep the hay diet tended to encourage shedding of *E.coli* O157, both in number of organisms and period of shedding. An abrupt change in diet from hay to grain concentrate had been observed to give a corresponding decrease in shedding; although some had noted that any significant change in diet is liable to increase excretion of *E.coli* O157. One result showed that fasting for 24 hours had no effect upon the shedding of *E.coli* O157. Research carried out in the USA had shown similar findings.

5.23 *E.coli* O157 tends to be more acid resistant than many other *E.coli*. It was interesting, therefore, to observe from one study that cattle mainly fed on grain had a lower colonic pH (i.e. more acidic) and more acid-resistant *E.coli* than cattle which were fed only hay. A brief period of hay feeding apparently decreased the number of acid-resistant *E.coli* - but not, according to other results described here, a reduction in the number of *E.coli* O157 organisms.

WHAT MIGHT BE DONE

Possible Interventions to Reduce *E.coli* O157 in Animals

5.24 We noted from the literature that a number of possibilities have been evaluated:-

- Trace-back and eradication (as practised, for example, in response to outbreaks of foot and mouth disease) presupposes a point or points of origin to which an outbreak can be traced. This is clearly not the case with *E.coli* O157 which was ubiquitous within the animal population and intermittent in its infection of individual herds and individual animals

- Testing of all cattle at any particular point in time (for example, immediately prior to slaughter) similarly suffered from the likelihood that *E.coli* O157 might be found widely across the animal populations and subject to a varying and erratic prevalence to make testing worthwhile. Since farms and herds were affected sporadically in the same way as individual animals, there appeared to be no benefit in testing selected groups of animals
- Management and diet might contribute something to the rate and/or period of excretion of *E.coli* O157. As we have seen above, a change towards a grain diet might reduce numbers of *E.coli* O157 in sheep. For cattle, we saw evidence that increasing the hay in feed tended to reduce the number of cattle shedding *E.coli* O157; although it had also been suggested that hay fed cattle might excrete for a longer period. In parallel with the foregoing, we have seen also that any change in diet, even if it reduced the volume of excretion, may well increase the numbers of *E.coli* O157 being excreted
- Competitive inhibition had been tried with some success on a small scale, and had received recent publicity from the University of Georgia, claiming that competitive organisms from the intestinal tract of cattle had been shown to be effective in eliminating *E.coli* O157 from 80%-90% of calves and grain-fed steers within a period of some two weeks. Although the researchers were moving to develop a feed supplement for commercial application, we noted that field trials had yet to be undertaken, and looked forward to seeing results of this work
- “Environmental” management to minimise multiplication of *E.coli* O157 had been suggested, e.g. strict control over feeding, bedding; chlorination of water sources, and cleaning of water troughs
- In relation to food sources, it had been suggested minimising transport might reduce stress-induced shedding; and the slaughter only of animals in the age range of 24-30 months might avoid contamination from high shedding younger animals
- No vaccine is currently available to prevent infection of cattle and sheep from *E.coli* O157 but research is being undertaken

Conclusions on Intervention

5.25 In conclusion, while we might encourage adoption of the best practice in the management of stock and look forward to progress in research, we found that no immediate interventions were available that would predictably reduce the occurrence of *E.coli* O157 in animals or the rate or period of excretion.

Post-Foot and Mouth Disease

5.26 The restocking of animals following Foot and Mouth disease will give a unique opportunity to follow the introduction and movement of *E.coli* O157 through the restocked herds. **We recommended that the Scottish Executive Environment and Rural Affairs Department should institute now, research to monitor the introduction and movement of *E.coli* O157 in some of these restocked herds.**

Routes of Infection to Man from Animals

5.27 Outbreaks were often associated with contaminated food or water. In Scotland sources of outbreaks that had been well documented included meat products, improperly pasteurised milk and cheese. There had been recent outbreaks associated with land

contaminated by animal faeces, and the contamination of a private water supply. These sources are dealt with in more detail in the chapters on land, water and food. In some, but not all, outbreaks it had been possible to trace the source right back to a group of animals and a link was established by detailed typing of the organism. This had been useful to help future control.

- 5.28 Many tracebacks to animals had also been carried out in small outbreaks or sporadic cases. In an early study carried out by SAC, in ten out of nineteen cases investigated, an animal source was identified. Tracebacks had more recently been employed throughout the UK to show the involvement of cattle, sheep, goats, geese, horses and dogs. Some of these studies had shown transmission to have occurred by direct contact with animals. Recent case control studies in Scotland, England and Wales had each highlighted that direct animal contact was a very important source for sporadic human infection.

Recommendations

- 5.29 **Given the lack of effective interventions in animals and to promote better understanding of the animal reservoir as the principle source of *E.coli* O157, we recommended the following actions**

- **Educate the public, and those with relevant occupational interest, on the prevalence of *E.coli* O157 in all ruminants, but mainly in cattle and sheep**
- **Advise farmers, other animal handlers and their families of the potential risks from contact with animals and their faeces or from cross contamination.**
- **Carry out more follow up studies back through multiple routes of infection**
- **Consider detection of other VTECs**
- **Maintain ongoing surveillance, identify risk factors and reduce spikes of excretion**
- **SEERAD should institute now, research to monitor the introduction and movement of *E.coli* O157 in some restocked herds post foot and mouth.**

CHAPTER 6

ORGANIC WASTE ON LAND

In this Chapter we:

- Consider current practices and controls for recycling and disposal of different wastes
- Assess the risks and responses in those wastes
- Draw conclusions and make recommendations that are proportionate to risk

We use the expression ‘waste’ in this Chapter to refer to any materials stored, dispersed or, recycled. We recognise that animal by products have important nutritional and soil conditioning properties and in this context are not waste but are a valuable natural product of animal production.

INTRODUCTION

- 6.1 We noted that the report of the Pennington Group (1997) identified (paragraphs 5.12 and 5.13 of that report) that the on-farm disposal of faecal waste and farm slurry was a contributory issue in the life cycle of *E.coli* O157. From the evidence available to them, that group found no strong reason to suggest that the spreading of such material should be prohibited, but recommended the precautionary step of promoting education/awareness of farm workers – which was implemented by publication in 1997 of guidance from the Scottish Agricultural College (SAC).
- 6.2 The Strategic Review of Organic Waste Spread on Land (“OWL”) carried out by the Scottish Environment Protection Agency (SEPA) in 1997-98 was commissioned by the (former) Scottish Office in response to public concern and media interest in the context of nuisance and public health. The 1998 “OWL Report” provided an authoritative view following wide consultation, on a range of wastes and application procedures.
- 6.3 The Task Force found very helpful guidance in the Prevention of Environmental Pollution from Agricultural Activity (PEPFAA) Code of Practice, produced by the Scottish Agricultural Pollution Group (SERAD, SAC, and SEPA). That Code helpfully describes processes and gives guidance on their management. It is intended principally for the benefit of those involved in farming and related activities but, incidentally, provides a useful collation of material beyond guidance, including reference to statutory instruments and other relevant documents. The code has no statutory force except in respect of Nitrate Vulnerable Zones.
- 6.4 Our consideration of organic waste spread on land (as the other topics of study) cannot be carried out in isolation from developments elsewhere. Hence we noted that the Scottish Executive had recently made its formal response to the SEPA “Strategic Review Of Organic Wastes Spread To Land” Report (the OWL Report) after protracted work related, we understand, to integration of the Report’s recommendations with the planned review of the Waste Management Licensing Regulations 1994 (WMLR 1994). In the main, the SEPA recommendations had been endorsed by the Executive. However, the response proposed not to end the spreading of organic material outwith daylight hours, nor injecting wastes into land with field drains (SEPA Recommendation 6.20). The recommendation at paragraph 6.19 of the OWL Report, to end spreading of

blood and gut contents from abattoirs, had been reserved meantime pending consideration of this issue by this Task Force.

- 6.5 From evidence available at the start of our study, the wastes of greatest initial concern to us involved the transmission of excreta from animals to land:-
- Directly in the field; and
 - In manures and slurries collected, sometimes stored and later spread on land.
- The risks that we sought to eliminate or minimise were
- Direct contact of people by *E.coli* O157-contaminated land or water; and
 - Contamination of vegetable/salad crops that would be consumed without processing to remove or eliminate *E.coli* O157 (or other pathogenic microorganisms).
- 6.6 Other material spread on land for beneficially conditioning the soil were: treated sewage sludge and septic tank sludges and “industrial waste”, the latter including distillery wastes, “crumble” from paper making and blood and gut contents from abattoirs (the wastes covered are specified in Schedule 3, Table 2 of WMLR 1994).

CONTROLS

- 6.7 In any consideration of waste management or disposal there were crucial issues of “control” and of “exemption”. Control was exercised mainly by the Waste Management Licensing Regulations 1994 (the licensing regulations) and by the Sludge (Use in Agriculture) Regulations 1989 (the sludge regulations). The licensing regulations, do not apply to faecal matter and other natural, non dangerous substances used in farming. That approach, which matches comparable EU legislation seemed to stem from a fundamental (and traditional) view of returning farming waste to land as fertiliser. This had fitted readily into the much more recent policy towards recycling and did, therefore, remain free of control. However the Executive was in the process of reviewing the coverage of non-natural agricultural wastes through new Regulations. Consequently there were few records in the public domain of incidence and volumes of such recycling of waste onto land.
- 6.8 Then there are the so-called “exempt wastes” by which was meant, we understand, that the wastes themselves were controlled within the licensing regulations, but that the process of application to land for waste recovery was exempt from the licensing process. Instead, the operation must comply with the terms and conditions of the exemption, which include
- Achieving benefit to agricultural or ecological improvement
 - Not harming the environment or human health
 - Limits on types and quantities of waste and
 - Registration with SEPA
- Such “exempt wastes” included some food processing wastes (mainly distillery waste), by products from the paper making industry (mainly crumble) and blood and gut contents from abattoirs. Among the lesser contributions to this category were septic tank sludges.

VOLUMES

- 6.9 The relevant volumes of each type of waste provided the first context for considering the risk of *E.coli* O157 from these materials. We noted from the SEPA OWL Report, estimates at that time (1998) of :-

Agricultural waste:	15,000,000 tonnes p.a.	96% of organic material
Exempt industrial waste:	367,000 tonnes p.a.	3% of organic material
Sewage sludge:	200,000 tonnes p.a.	1% of organic material
Composted waste:	?	Less than 1%

In view of the need to consider the relative risk from blood and gut contents from abattoirs, it is useful also to note here that within the “exempt industrial wastes” figures shown above, the component in relation to abattoir blood and gut contents was:-

Abattoir blood & gut contents:	26,000 tonnes p.a.	0.16%
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A further relevant figure (not included above) was the estimate in the OWL Report of wastes excreted directly from animals to land.

Direct excretion to land:	10,000,000 tonnes p.a.	66% addition to organic material spread on land
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AGRICULTURAL WASTES

- 6.10 Agricultural Wastes might be taken to be manures, livestock slurries, and silage effluent. The type and volume of waste on a particular farm would depend upon the type of stock, the form of animal housing, the form of animal bedding and collection arrangements. The process of recycling this material to land was regarded by the farming community as a normal part of farming activity and, as mentioned above, the spreading of such material on land was not controlled by the Waste Management Licensing Regulations 1994. Considering the estimate by SEPA in the “OWL Report” of 15 million tonnes of such wastes spread per annum, this was by far the largest component of all material spread on land – again, according to the OWL Report, 96% of the total.
- 6.11 The fact that this process was not regulated meant that the detail of practices, and the success rate were unknown. However, for farmers to successfully produce satisfactory products they will probably know how much of the fertiliser their land can accept – too much fertiliser may be as bad as too little. The philosophy which allowed this activity to continue outwith the full waste management regime assumed that such materials were recycled for benefit to the soil, either in terms of its structure or chemical composition. The PEPFAA Code of Practice provided detailed guidance on good practice in the spreading of agricultural waste, including the need for prior assessment of the needs of the ground, its capacity to accept the waste and consideration of factors such as weather, growing crops and proximity to sources of water supply.
- 6.12 The Scottish Agricultural Pollution Group (SAPG) annual pollution statistics indicate that an increasing percentage of agricultural pollution events are attributable to the run-

off of organic wastes from farmland, particularly livestock wastes. Other SEPA figures indicate that, unless significant changes are made to the way in which land is managed and farming practices are conducted, diffuse agricultural pollution will be the most significant cause of river pollution by 2010.

Storage

- 6.13 We were advised by farming representatives that one of the weaknesses in recycling organic materials to land was the limited storage capacity for pumpable wastes (slurry) on-farm. In theory it was possible to plan the spreading regime to coincide with the planting and growing cycle and to respond to weather conditions. In practice a farmer could have little option but to spread agricultural wastes in whatever windows of appropriate weather presented themselves. At the same time, it was said that farmers had no incentive to invest in large storage facilities when they had a recycling opportunity on their own land. Costs of these structures were high and planning legislation tolerated small incremental additions more easily than major expansions of storage capacity.
- 6.14 The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 1991 and the PEPFAA Code of Practice recommended 6 months storage capacity unless it could be demonstrated by means of a Farm Waste Management Plan that a lower capacity would not increase the risk of pollution. There is also an exemption from this 6 month storage requirement for existing storage facilities constructed prior to 1st September 1991. Evidence from the Scottish Agricultural College (SAC) advised that pathogen numbers in slurry are significantly reduced by batch storage¹. Where there is a need to reduce pathogen numbers, 1 month storage capacity should be the absolute minimum to reduce pathogens to acceptable levels and 3 months is preferable. SAC also advised that a survey carried out by them in Ayrshire demonstrated that only 50% of the farms surveyed had more than 3 months' capacity; while 2% of farms visited had less than 1 month's capacity.
- 6.15 We were advised by the farming sector that the capital costs of increasing storage capacity was very high. It was suggested that industry was unlikely to invest in more storage capacity unless there was financial assistance to encourage them to do so.
- 6.16 From our discussions on this topic, we learned that the standard slurry storage tank, open at the top, could take maybe 70-80% of its capacity of slurry, the balance of space being left for collection of rainwater. The addition of a covering, the obvious course to increase storage capacity, was excessively costly/impractical. We learned that a cover adequate to withstand wind and weather would substantially increase the structural specification and hence cost of the tank.
- 6.17 We heard that greater attention had been paid in recent years to the separate diversion of rainwater from roofs, etc., to avoid filling slurry tanks unnecessarily.
- 6.18 SEPA advised that wet weather conditions had been an important factor behind recent substantiated agricultural pollution events. The year 2000 was typical of other wet years in that discharges of dirty water and livestock slurry were more common. The

¹ Each batch stored separately with no fresh material added.

apparent inability of collection and storage systems to cope with the additional volumes of waste produced was worrying and was a possible signal that investment in slurry storage capacity had been neglected on some farms. Whatever capacity was provided, the overall management of farm slurries and animal manures also needed to be upgraded to match the increased storage capacity. It was becoming increasingly apparent that collection and storage systems need to be designed and operated so as to protect the environment during the wettest conditions, as well as for extended dry periods. Being prepared for poor weather conditions involved adequate slurry storage provision, effective farm waste management planning and an assessment of the suitability of the land for the receiving of the volume of waste produced.

- 6.19 Manures which are not pumpable might be spread when fresh, but more usually were stacked for some time before use as a soil conditioner/fertiliser.

Survival of the Organism

- 6.20 The effect of the storage process upon the pathogen content of these wastes is not properly understood. The Food Standards Agency has assumed responsibility for a research project commenced in July 1999 under the sponsorship by the Ministry of Agriculture Fisheries & Food (MAFF) to study "Pathogens in Animal Manures: Their Levels and Survival Both During Storage and Following Application to Agricultural Land". The project runs to December, 2002.
- 6.21 The survival period of *E.coli* O157 in soil had been estimated variously between 70 and 100 days. Deposits on the surface were first diminished by the effects of UV in sunlight. Pathogens were believed to be absorbed within the first few centimetres of soil rather than penetrating more deeply. Hence spreading in fairly dry conditions was preferable; and disturbance of the surface conditions soon after spreading (by agricultural activity or by recreation in wet conditions) was likely to promote contact with any pathogens present. In general, faecal material which had spent some time in storage before being spread on land was judged to be generally of less risk to humans than directly excreted material provided it is managed in batches and fresh material has not been added to the previously stored material.

Farm Waste Treatment

- 6.22 Treatment of manures/slurry to remove pathogens and reduce nuisances before spreading on land can take the form of composting, lime pasteurisation, (for liquid wastes); or indeed spreading itself provides a form of treatment by exposing the material to ultraviolet sunlight.
- 6.23 Composting is a natural process, well known and widely practised. The decay of *E.coli* O157 (as with pathogens generally) increases with rising temperature and reducing water content. We were unable to establish average storage periods for such solids or the proportion of the pathogens that might be destroyed. Such information would be helpful as a starting point for considering some specification or standards for the process, currently lacking.
- 6.24 Lime pasteurisation was recommended to us by one commercial interest and by a waste disposal contractor, and was known to many interests. In this process, manures stored

with the addition of lime were stated to increase in pH to 12 or greater and to a temperature of 50°C effectively killing potentially dangerous bacteria. The process was stated to operate effectively in some 2 hours allowing spreading in suitable conditions after short storage periods. Storage space was thereby minimised (see also paragraph 6.39 in relation to sewage sludge).

6.25 Small-scale adoption of this technique was said to be commercially possible now.

Direct Excretions to Land

6.26 The OWL Report estimated the volume of faeces from cattle in the field as some 10 million tonnes per annum, or 66% additional to the volume of farm waste recycled to land in 1998. This volume is not included in SEPA's estimate of wastes spread since it results from a natural farming process.

6.27 From the evidence described in Chapter 5, "Animals & Environment: Understanding the Risks" we noted that almost a quarter of Scottish cattle herds will have at least one animal excreting *E.coli* O157 at any one time. A comparable figure from the England and Wales Prevalence Study in Sheep is under 2%. However, as we will see later in this Report, experience from the Scouts Camp at New Deer, Aberdeenshire in May 2000, provided later (and different) evidence regarding excretion from sheep. In that case, individual animals were found to be excreting up to 10 million organisms per day; and evidence from the University of Aberdeen showed that total (flock) daily output of 10,000 million organisms of *E.coli* O157 were being shed at the time the Scouts arrived at New Deer.

6.28 In the view of the Task Force, **this source represented the highest risk of infection from *E.coli* O157. Fresh deposits from infected animals might carry large numbers of the organism and could retain significant numbers over several weeks – although estimates of their survival period varied.** As mentioned above, research was under way into the survival of pathogens, including *E.coli* O157 in manures and animal waste both in storage and in the field. Although the presence of the organism posed no risk to the animals themselves, there were potential risks in this situation for workers or their families, especially to children, by direct contact with animals or by person to person spread.

6.29 Run off in wet weather can affect watercourses, springs or boreholes which may be used for water supplies. Furthermore, the spreading of contamination by rainfall brings the organism closer to those visiting the countryside for recreational purposes where in dry weather conditions, the contamination would be less widespread.

6.30 The implications for water supply, recreational use of land and avoidance of infection are dealt with elsewhere in this Report.

Conclusions on Agricultural Wastes

6.31 We acknowledge the lack of firm information regarding practices in relation to spreading of agricultural wastes on land. That accepted, however, it is our overriding impression that much that needs to be done to ensure greater safety from *E.coli* O157 (and other pathogens) exists already in the form of guidance, for example, in the

PEPFAA Code of Practice. The large and useful volume of organic material produced on farm or as a by-product of farm processes was well used as a soil fertiliser and for soil conditioning purposes (subject to reasonable controls). To regard them as a waste for disposal would not be correct. It has been a fundamental principle of the Task Force to seek to make the existing activities safer from *E.coli* O157 (and other pathogens) rather than to prohibit or unreasonably restrict them.

6.32 However if the study carried out in Ayrshire bathing waters was found to be typical of recycling organic material from farms to land could require a number of improvements to livestock waste handling, storage and application procedures in order to reduce pollution risks.

6.33 As in other parts of our study, we formed the impression that information about available guidance was not consistently known within the farming community. The Report of the Pennington Group (1997) recommended that an education/awareness programme should be put in hand and updated periodically. **We recommended that such action would again be worthwhile, together with a commitment to periodic revision and publication.**

6.34 **In relation to agricultural waste, we recommended that**

- **The PEPFAA code guidance on waste management and recycling should be the subject of a concerted consultation programme by the Scottish Agricultural Pollution Group with farmers, other land managers and contractors as part of the Executive's review of the Code.**
- **A generic risk assessment format should be part of Farm Waste Management Plans and of the consultation referred to above.**
- **An education and awareness-raising campaign on waste storage, practical treatment and application should be initiated by the Executive through the Scottish Agricultural Pollution Group for farmers, other land managers and contractors.**
- **As part of the foregoing campaign, the Executive, with the Scottish Agricultural Pollution Group, should strengthen waste management/recycling practice through incentives for creation and implementation of farm waste management plans.**
- **Farm/product assurance scheme should be encouraged to adopt PEPFAA guidance, including Farm Waste Management Plans, as prerequisites.**
- **Steps to minimise volumes and leakage of contaminated water should be encouraged by the Scottish Agricultural Pollution Group.**
- **More Quality Control and Quality Assurance should be established for exempt industrial wastes brought in off-farm and also for irrigation (see also 'Sewage**

SEWAGE SLUDGE

6.35 According to the OWL Report, this amounted to some 200,000 tonnes per year in 1998, i.e. 1% of waste spread to land. The process seemed to have attracted a fair amount of interest and regulation, being covered by the Sludge (Use in Agriculture) Regulations 1989.

- 6.36 The approach enshrined in the 1989 regulations, was based upon establishing and maintaining multiple barriers and conferred significant protection. The barriers include
- Pathogen reduction in the sewage treatment process
 - Pre-spreading judgement of restriction based on soil type and harvest period
 - Natural decay of pathogens in soils
 - Natural barrier left between soil and harvested crop
 - “No grazing” period for livestock after spreading
- 6.37 Heat treatment of sewage sludge has been practised at sewage works for many years, partly to remove offensive odours but, in more recent years, more with pathogen removal in mind. The most common form of treatment is, mesophilic anaerobic digestion, the standards of which are set by the DETR 1996 Code of Practice on the Use of Sewage Sludge on Agricultural land and the Safe Sludge Matrix. Since 1998 the practice of disposal of sludge at sea has been illegal and, therefore, increasingly, disposal methods on land have been sought. One control mechanism recommended to us by a number of participants was the “Safe Sludge Matrix” - commonly referred to as the ADAS Matrix. This represents a voluntary agreement made between Water UK (Scottish and English Water Authorities) and the British Retail Consortium and includes input from the Environment Agency, (former) Department of Environment, Transport & The Regions, (former) MAFF, SEPA and the Food Standards Agency. Preparation of the matrix by the (former) ADAS included consultation with farming organisations, food manufacturers, and food processors. A copy of the matrix is reproduced at Annex 4. The Government have announced that they intend to enshrine its provisions in statutory regulations.
- 6.38 The objective of the matrix is that application of untreated sludges to crops and grass is prohibited. The Matrix (see Annex 4) describes the circumstances in which treated sludges could be used.
- 6.39 Advanced (or enhanced) treated sludges (e.g. thermally dried or heat treated), as described in the Matrix, which could be spread on all crop types, are those which had undergone a process capable of virtually eliminating any pathogens which may have been present in the original sludge. The lime pasteurisation process, described earlier in this section, resulted in the inactivation of pathogens. This was the result of elevated pH (greater than 12) and the effects of ammonia liberated during the treatment. Depending on the type of lime used, the process produced heat which could raise the temperature to 50°C or slightly above. We learned that certain of these advanced processes were a prerequisite of some farm assurance schemes.
- 6.40 We acquired no firm view of the likely level of *E.coli* O157 to be found in sewage sludge, but given that it is human waste, we expected the levels of the organism in sewage sludge to be negligible. The UK Water Industry Research Project has demonstrated that *E.coli* O157 was rarely detected in sewage sludge. On completion in 2001, this research will give a much fuller picture.
- 6.41 We learned that the Executive has plans to update the Sludge (Use in Agriculture) Regulations 1989 on a timescale possibly commencing after December 2001.
- 6.42 In relation to potential risks from *E.coli* O157, we noted that sewage sludge is human waste, not from ruminating animals, and thus unlikely itself to be a significant source of

O157. The volume of sewage sludge being deposited on land is relatively low and there is limited scope for contact between sewage sludge and humans. We noted that this volume is set to rise as a result of ending of disposal at sea and stricter treatment of sewage required under the **UWWTD**. Whilst it is expected that the amount spread will increase, this would still represent only a very small proportion of all agricultural land. In relation to the risk from *E.coli* O157, **we therefore concluded that sewage sludge may be regarded as a relatively low risk material.**

SEPTIC TANK SLUDGES

6.43 In many ways, these materials have similar characteristics to sewage sludge in relation to *E.coli* O157. Again, with a relatively low risk of contamination, this material is currently exempted as a waste recovery operation under the Waste Management Licensing Regulations providing it complies with the terms and conditions of the exemption. We were advised that there was a low risk of *E.coli* O157 being present in some septic tank sludges e.g., by cross-contamination from farmyard washings, but there would be a higher risk of other pathogenic organisms being present.

BLOOD & GUT CONTENTS FROM ABATTOIRS

6.44 According to the OWL Report, this material amounted to some 26,000 tonnes in 1997, i.e. 0.16% of the total organic material spread to land. The volume being spread in 1997 was, therefore, a very small proportion of organic material being spread to land, although we were advised that spreading of this small volume could be concentrated in a small area. The spreading of this material on land is currently exempt as a waste recovery operation under the Waste Management Licensing Regulations (WMLR). The exemption is subject to an annual limit of 250 tonnes per hectare per year, registration with SEPA and compliance with the terms and conditions of the exemption, including protection of the environment and human health.

6.45 The spreading of blood and gut contents from abattoirs has assumed a high profile for some years and, apparently, there has been much correspondence and pressure upon the Scottish Executive to tighten current controls. We have been made aware (not least by the residents of Blairingone (Kinross)) of perceived malodour, nuisance and public health risks posed by allegedly excessive and uncontrolled disposal of industrial wastes to land near to local residential communities. The Blairingone exempt waste spreading was said to relate to a mix of exempt industrial wastes. For example, the residents' evidence referred to the finding of *E.coli* O157 in paper making waste analysed for a television company by Heriot Watt University.

6.46 We have taken the issue of blood and guts waste from abattoirs seriously, despite the relatively small volumes being put on land. Although often classed as a homogenous material we thought it more helpful to consider the components of this waste separately

6.47 First we looked at **the risk of *E.coli* O157 in blood from abattoirs**. We acknowledged a possible perception in the minds of the public that the blood of dead animals is a health risk. At the time of slaughter the muscle (meat) and blood of animals should be sterile. The challenge to the slaughterhouse was to ensure that sterile material was not

cross-contaminated e.g. by contact with soiled hides or with gut contents spilled because of poor hygiene practices.

- 6.48 As part of our study, we sought a snapshot of current practice at one abattoir. We confirmed that blood was drained from the animals immediately after stunning and was ducted away for temporary storage pending removal. In the example that we saw, blood was stored in 2 tanks outdoors and was uplifted by a contractor every second day.
- 6.49 Blood could of course be a good culture medium for growing bacteria, such as *E.coli* O157, indeed blood products could be used for such purposes. The crucial factors were temperature and time.
- 6.50 Fresh blood is known to have short-term anti-bacterial properties. The University of Aberdeen showed results of work in the laboratory in which blood spiked with *E.coli* O157 was monitored at 5°C, 15°C and 30°C. After an expected initial fall in O157 levels, no perceptible growth occurred at 5°C or 15°C, but at 30°C there was a 1,000-fold increase in 30 hours. Hence storage at chill or ambient temperatures may be taken not to promote growth of the organism, but at higher temperatures a short storage time becomes critical.
- 6.51 **We therefore recommended that, since *E.coli* O157 could be present in cross-contaminated blood (which is a small possibility), storage at 15°C or below would be a sensible precaution. If cool storage was not practicable, consideration should be given to more frequent removal from the abattoir i.e. daily.**
- 6.52 If managed properly before disposal blood should pose no significant risk of infection from *E.coli* O157. We considered its locus as a carrier of *E.coli* O157 and concluded the risk to humans to be negligible.
- 6.53 We were aware of the potential odour problem from blood spread on land. We noted also the considerable potential for damage to watercourses and fish by blood, due to the high biochemical oxygen demand (BOD), which may account for another aspect of public concern. These are primarily for others to address – but see paragraph 6.62 below.
- 6.54 **In relation to the risk from gut contents**, again we sought a snapshot at one abattoir. We followed the abattoir process time and again to establish the way in which material was handled and our perception of the risk that this process posed. We witnessed repeatedly the skilful sealing of the digestive tract and removal of the gut intact. The process of clipping the oesophagus and bagging at the lower end required considerable care on a heavy, swinging carcass. Rupture of the gut and spillage of its contents was regarded as a serious failure within the abattoir and significantly affects the supervising official veterinary surgeon's assessment of hygiene in the plant if the occurrence was at all frequent.
- 6.55 Gut removal took place some distance from the point at which blood was drained from the carcass. Veterinary advice suggested that occasional regurgitation was possible in an animal suspended by its hind legs for bleeding out, but was not a significant factor in relation to the rapid speed of bleeding, the large amount of blood being drained and the

progress of the carcass down the slaughter line. For any practical purpose, therefore, the blood and gut contents were removed separately and stored separately

- 6.56 In the gut room at the abattoir we saw the removal of contents of 2 distinct types. Rumen, from the first stomach was a kind of partly fermented grass which was removed, stored, and taken regularly by a local farmer for composting. Veterinary advice was that the flora and pH in which this material is digested is quite different from that of the intestines where the *E.coli* O157 is likely to be found. We were advised of no appreciable risk from the rumen.
- 6.57 In our earlier consideration of this topic, we had learned that amending legislation of October 2000 had included the intestines of bovines as Specified Risk Material (SRM) which had to be stained blue and disposed of as part of the BSE statutory controls regime. We did indeed witness the staining and storage of this material.
- 6.58 With regard to the intestinal contents, we were advised that it was impractical to try to recover the contents without taking tissue from the gut itself. It was common practice, therefore, to dispose of the intestines complete with their contents, all as SRM. We note that there may be some abattoirs which still did recover a small amount of gut content, but the volumes of such material from bovines must be very small. The volume available for spreading must have been significantly reduced from the already small amount observed in 1998.
- 6.59 We concluded, therefore, that there was a potential but very small risk from the spreading of gut contents from abattoirs. In principle, it might well be correct for the Scottish Executive to consider consulting on a change to its licensing regulations to require gut contents to be treated before spreading or, if gut contents were mixed with blood before spreading, then the blood and gut contents mixture to also be treated. In terms of our commitment to proportionality **we concluded that we could not justify such action when hugely greater volumes were excreted directly by animals and spread on land.** So the smaller amount of blood and gut contents now available for spreading had to be seen in the context of the vast volumes of other, much more potentially pathogenic material being spread to land.
- 6.60 From our work it seemed to us that gut contents could be regarded as similar or less in hazard to excretions direct to land from animals in the field. The annual volume of direct excretions is far in excess of the small amount of abattoir waste spread on land. We were advised also that the negative public perception in relation to abattoir wastes had inclined the farming community against accepting the material for land spreading, and we believe that the amount now recycled on agricultural land to be significantly less than the 26,000 tonnes estimated in the OWL Report. We do not have a current figure.
- 6.61 Relatively to the (then) perception of relative risk, and the (then) recent negative experience of *E.coli* O157 in the central Scotland outbreak of 1996, the notion of recycling of abattoir waste from animal to ground to animal in an upward spiral was a reasonable driver to the OWL study, as was then commissioned from SEPA by the (former) Scottish Office. Our current best information shows that this does not happen

- 6.62 We hear and take seriously the concerns of those who suffer from allegedly inappropriate spreading from possible malodour nuisance and pollution risk. We were advised (and the OWL Report has noted previously) that abattoirs rarely provided more than immediate storage of blood and gut contents material; and frequently the management and disposal of it would be delegated to a sub-contractor. Conditions for spreading may not be suitable but, if storage is limited, spreading may follow regardless of conditions. We understood that concerns about recycling of this material, together with the other representations about nuisance referred to above, were major factors in the commissioning of the OWL Report.
- 6.63 Having considered both the Local Authority and SEPA roles in such matters we were satisfied that SEPA would act to investigate or restrict activities if the Local Authority advised that there was a risk to public health.
- 6.64 The question of exemptions to waste management licensing was very relevant to this issue. The basic presumption of recycling for beneficially conditioning and providing fertiliser for the soil was essential to our acceptance of the process. We perceived a temptation for spreading organisations to take advantage of the flexibility of the exemption and/or the guidance supporting it. At present SEPA is entitled to receive only a 6 month forward plan of estimated volumes to be spread. **We therefore recommended the Scottish Executive consider exempting the spreading of industrial waste conditional upon:**
- **The contractor satisfying SEPA of its satisfactory pre-spreading assessment for the site**
 - **SEPA being satisfied through site inspection that the spreading carried out under exemption did not cause environmental pollution. This topic should be included also in the initiatives for education and good practice recommended at paragraph 6.34.**
- 6.65 We noted however that research work has recently been commissioned by the Food Standards Agency to study “The Levels of Pathogens in Abattoir Wastes Spread to Land”, which is due for completion in September 2002. At the time of writing this Report, there was no early output from that work.

SUMMARY OF RECOMMENDATIONS

- **That an education/awareness programme for the farming community would again be worthwhile together with a commitment to periodic revision and publication**
- **The PEPFAA code guidance on waste management and recycling should be the subject of a concerted consultation programme by the Scottish Agricultural Pollution Group with farmers, other land managers and contractors as part of the Executive’s review of the Code.**
- **A generic risk assessment format should be part of Farm Waste Management Plans and of the consultation referred to above.**
- **An education and awareness-raising campaign on waste storage, practical treatment and application should be initiated by the Executive through the Scottish Agricultural Pollution Group for farmers, other land managers and contractors.**

- **As part of the foregoing campaign, the Executive, with the Scottish Agricultural Pollution Group, should strengthen waste management/recycling practice through incentives for creation and implementation of farm waste management plans.**
- **Farm/product assurance scheme should be encouraged to adopt PEPFAA guidance, including Farm Waste Management Plans, as prerequisites.**
- **Steps to minimise volumes and leakage of contaminated water should be encouraged by the Scottish Agricultural Pollution Group**
- **More Quality Control and Quality Assurance should be established for exempt industrial wastes brought in off-farm and also for irrigation (see also ‘Sewage**

- **Store blood at 15°C or below (if not practicable, consideration should be given to more frequent removal from the abattoir i.e. daily)**
- **The Scottish Executive consider exempting the spreading of industrial waste conditional upon**
 - **The contractor satisfying SEPA of its satisfactory pre-spreading assessment for the site**
 - **SEPA being satisfied through site inspection that the spreading carried out under exemption did not cause environmental pollution. This topic should be included also in the initiatives for education and good practice recommended at paragraph 6.34.**

CHAPTER 7

WATER SUPPLY

In this Chapter we:

- Consider possible routes of contamination of both public and private water supplies
- Consider measures to improve and protect these supplies

INTRODUCTION

- 7.1 The potential for infection by humans of *E.coli* O157 from water has been known for some time and there have been numerous recorded outbreaks in Scotland and elsewhere associated with contaminated water from both public and private supplies.
- 7.2 Cattle, sheep and other animals may excrete *E.coli* O157 in their faeces (see Chapter 5). We were advised that the main risk from *E.coli* O157 entering water sources was from either direct faecal contamination by the animals or run off from agricultural land, either after slurry spreading or from grazing land after heavy rainfall.
- 7.3 We noted the results of the case control study carried out in Scotland from 1996 to 1999. This study did not identify an association between *E.coli* O157 and the consumption of water although some cases were attributed to untreated water.

CONTROLS

- 7.4 In the UK, drinking water quality regulations set the standard for water supplied for human consumption and transposed the requirements of the 1980 European Drinking Water Directive in relation to both public and private supplies. The separate Water Quality Regulations for Scotland, England, Northern Ireland and Wales (currently being reviewed) each set the standard that drinking water should not contain any coliforms or *E.coli* bacteria in 100 ml of water.
- 7.5 Standards are set for the levels of coliforms and *E.coli* permitted within both public and private drinking water supplies. There are no specific standards laid down for *E.coli* O157 within the regulations although they do state that water should not contain substances or organisms harmful to health. The presence of coliforms and *E.coli* give an indication of the quality of the water and that faecal material may be present i.e. they are indicators of potential pollution. The presence of such indicator organisms indicates there is a risk that *E.coli* O157 may be present. We noted that the infective dose of *E.coli* O157 appears to be low (see paragraph 2.21) and we therefore judged it important that drinking water supplies should conform to the standards laid down.
- 7.6 Responsibility for ensuring the integrity of public water supplies rests with the statutory water undertakers in the UK (the water authorities in Scotland; the water companies in England and Wales; and the water service in Northern Ireland). In addition Local Authorities may take samples of water from the mains distribution system to verify quality of water being distributed.

- 7.7 Responsibility for maintaining private water supplies rests with the owners. Responsibility for monitoring private water supplies and bottled water rests with the Local Authorities. Bottled waters are dealt with in Chapter 9 (Food).

RESEARCH

- 7.8 In 1997, the Environment Group of the (former) Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD) commissioned the Water Research Council (WRC) to carry out a scoping study to examine the existing evidence for waterborne transmission of *E.coli* O157 in water. They found no evidence to indicate that *E.coli* O157 was more persistent in the environment or more resistant to water treatment processes than the non-pathogenic *E.coli* found in the gastrointestinal tract.
- 7.9 The WRC identified areas for further research to allow the threats to water supplies to be understood better. Research work is currently being undertaken by the Scottish Agricultural College and the University of Aberdeen into "The survival and dispersal of *E.coli* O157 in Scottish soils and potential for contamination of private water supplies". This work is due to be completed at the end of 2002. Preliminary findings from this work suggests that *E.coli* O157 can survive for up to 21 days in water. Future research should obtain better information on the fate of *E.coli* O157 in the environment and during water treatment processes.

PUBLIC WATER SUPPLIES

- 7.10 Water for mains supply in Scotland and the UK is subjected to a series of treatment processes including filtration and disinfection after abstraction from the source, to ensure it is safe to drink. *E.coli* O157 is as susceptible to chlorination as are other non-pathogenic strains of *E.coli*. It should not, therefore, be present in properly treated and protected mains water. Where there had been incidents of *E.coli* O157 associated with public water supplies it was normally due to contamination of the supply after treatment.
- 7.11 There had been several outbreaks of *E.coli* O157 associated with public water supplies, both in Scotland (1990, Tarves; 1995, Freuchie) and elsewhere (1989, Missouri; 1990, Japan; 1999, New York; and 2000, Walkerton). The incident in Tarves was believed to have resulted from a subsidiary water supply which was possibly contaminated with cattle slurry, and the incident in Freuchie was as a result of an illegal cross-connection from a sewage-polluted stream to the distribution system, both contaminated after treatment and during distribution. The outbreak in Missouri resulted from contamination of the ground water during distribution. The incident in Japan resulted from water from a contaminated well supplied to a nursery.
- 7.12 The outbreak in Walkerton, Ontario, Canada, resulted in 1346 reported cases of *E.coli* O157 and 6 deaths. Contaminated water was identified as the source of the outbreak and was caused by contamination of a municipal well water supply after heavy rainfall and flooding. Coliform failures had been reported in the period leading up to the outbreak and increased testing was instituted after the flooding. *E.coli* O157 was subsequently identified in the water supply. Although increased chlorination of the water was then undertaken a boil water notice was issued only some days later. Investigations revealed that a well supplying the distribution system had been subject to

surface water contamination close to a farm where cattle were excreting *E.coli* O157. There had also been an intermittent fault in one of the chlorination units. This outbreak demonstrated the devastating consequences of failures in the treatment of public water supplies and the potential for such incidents to affect a large number of people when effective remedial action was not undertaken immediately coliform failures were identified.

- 7.13 Water authorities in the UK routinely tested both the raw water supply and, on a more frequent basis, the treated water supplies, for coliforms and *E.coli*. Frequency of testing of the treated water was based on the number of people being supplied. We were advised there could be risks from water from a high risk catchment area, i.e. where cattle and sheep have direct access and diffuse pollution inputs exist, and where the treatment on occasion may be ineffective. **Where water was from such a public supply we recommended that the water authority gives particular attention to coliform and *E.coli* testing. Where coliforms or *E.coli* were detected repeatedly in a supply, routine testing for *E.coli* O157 should be considered.**
- 7.14 We noted evidence which showed that coliforms and *E.coli* were reduced by water treatment processes, e.g. filtration. The main risks of contamination of the public water supplies with coliforms and *E.coli* O157 arose therefore, when failures in the water treatment process occurred or when the water was contaminated after the treatment process had taken place.
- 7.15 We remained concerned at the large numbers of people who could be affected arising from failures in the water treatment process. We were advised by one of the Water Authorities that where there were any problems with the disinfection process, or where high levels of *E.coli* were detected in the treated water, this would result in them immediately testing the water for *E.coli* O157. If a serious risk of microbiological contamination to the public from a water treatment works or from contamination during distribution arose, the public would be requested to boil the water.
- 7.16 We were advised by one water authority in Scotland that both raw and treated water within its area had been analysed for the presence of *E.coli* O157 since 1994. This analysis was carried out both as a routine survey and after water treatment failures. *E.coli* O157 was detected only 3 times and always in public raw water supplies.
- 7.17 We understood that, where coliforms or *E.coli* were detected, the source of the contamination would be identified and immediate remedial action taken by the water authority. Routine minor bacteriological failures, usually associated with taps in consumer's properties, should not automatically trigger a test for *E.coli* O157. **Where a supply has had repeated coliform and *E.coli* failures and/or known treatment works failures we recommended that testing for *E.coli* O157 should be carried out and boil water notices issued as appropriate**
- 7.18 Despite the possibility of contamination of water supplies with *E.coli* O157 we heard no evidence to suggest that properly disinfected and properly protected public water supplies were a risk to public health since the treatments in place appeared to be effective against *E.coli* O157. Water quality results over the past ten years have clearly demonstrated a substantial reduction in the numbers of bacteriological failures associated with public water supplies. The general level of quality control and response

to incidents should provide public confidence that the risk from *E.coli* O157 in public supplies is very low and should continue to reduce as the national water treatment assets are modernised.

PRIVATE WATER SUPPLIES

7.19 Private water supplies are governed by the private water supply regulations, which transpose the 1980 European Drinking Water Directive in relation to private water supplies. These regulations place a responsibility on local authorities throughout the UK to monitor and improve private supplies.

7.20 The Private Water Supply Regulations classify private water supplies into:

- Category 1 where water is used solely for domestic purposes and
- Category 2 supplies where water is used as part of a commercial operation, a definition of which includes food production and provision to hospitals and holiday establishments

These are further subdivided into classes and microbiological sampling frequencies are set out as follows:

Category 1. Domestic Supplies

Class	Number of people normally served by the supply	Frequency of Sampling and testing
A	More than 5000	24 times a year
B	501 – 5000	12 times a year
C	101 – 500	2 times a year
D	25 – 100	Once a year
E	Less than 25	Once every 5 years
F	Single dwelling	No prescribed regular sampling or testing

Category 2. Commercial Operations

Class	Cubic metres of water used from supply each day	Frequency of sampling and testing
1.	More than 1000	24 times a year
2.	101 – 1000	12 times a year
3.	21 – 100	12 times a year
4.	2 – 20	2 times a year
5.	Less than 2	Once a year

7.21 Sampling frequencies are dependent on the class of supply and can vary from 24 times a year to only once every 5 years or, as in the case of class F supplies, not at all. However, there is a duty on Local Authorities to take such steps as they consider appropriate to keep themselves informed about the wholesomeness and sufficiency of all private water supplies in their area. The costs associated with sampling class F supplies would need to be borne by the Local Authorities themselves. Private water supplies are subject to the same quality standards as public supplies, including the requirement that coliforms and *E.coli* should be absent in 100 ml samples of water but it is not an offence under the existing legislation to fail to comply with these standards.

- 7.22 We noted that the Private Water Supplies Regulations are to be amended in the near future in order to comply with the EC Drinking Water Directive (98/83/EC) and will continue to ensure that all Category 2 supplies will have to comply with the coliform and *E.coli* standards laid down within the amended regulations. The amended regulations may not apply to all existing Category 1 supplies (those supplies in the current category E and F as well as the smaller D supplies may be covered by separate regulations following a separate consultation.
- 7.23 Private water supplies are usually sited in rural areas and are therefore vulnerable to contamination from various sources. In Scotland there are approximately 30,000 private water supplies serving just over 1% (60,000) of the total population, with the highest number to be found in Aberdeenshire, Perth and Kinross, Dumfries and Galloway, and Highland.
- 7.24 In Scotland, Class F supplies account for some 75% of the population served by Category 1 private water supplies. We were concerned to note that, as outlined in the above table, no checks are required to be carried out on Category F supplies, i.e. supplies to a single dwelling. We heard evidence of a recent study of 82 randomly selected Category 1, Class F supplies within Aberdeenshire. The supplies were sampled 3 times over the course of a year and tested for both coliforms and faecal coliforms. Results indicated that around 89% of those supplies failed to comply with microbiological drinking water standards.
- 7.25 Previous work carried out in the UK had also demonstrated that between 77% and 84% of private water supplies fail to meet the drinking water standard. Although the standards laid down do not require to test for *E.coli* O157, many of the samples had high levels of coliforms and, in particular, faecal coliforms, present, indicating that faecal contamination of the water supply had occurred.
- 7.26 We received evidence on the condition of some of the private water supplies, subject to the study in Aberdeenshire referred to above, which demonstrated that the source of these supplies were often not stock proofed, or had insufficient protective coverings, thus allowing direct faecal contamination of the water by cattle, sheep and other animals or pests. We also saw evidence of some supplies where spreading of slurry had taken place up to and over the source of the supply thus, again, allowing contamination of the water source. We thought this a needless and sometimes careless risk when some basic security and basic cleaning would secure a safer supply.
- 7.27 The PEPFAA Code, the observance of which was found to be highly variable throughout the country, recommended that slurries, manures, liquid sewage sludges and other organic wastes should not be spread within 10m of a watercourse and not within a 50m radius of any spring, well or borehole which provided water for drinking, domestic or commercial use, to reduce the risk of contamination.
- 7.28 The Code also recommended that every farm should draw up a farm waste management plan to establish safe methods of spreading of waste to prevent the pollution of watercourses. It outlined one of the key steps which could be taken to prevent diffuse pollution of watercourses was by fencing them off to livestock. **We considered this extremely sensible advice and recommended that**

- **The PEPFAA Code should also include a requirement for fencing off water sources e.g. springs, wells and boreholes and**
 - **That the Scottish Executive should consider means of making this a mandatory requirement for private water supplies.**
- 7.29 The Pennington Report acknowledged the benefits in educating farm workers about the potential hazards involved in the use of untreated slurry or manure - notably where material is to be spread near sources of private and potentially untreated water supplies. In response to this threat the (former) Scottish Office Water Services Unit issued guidance leaflets entitled “Keeping It Safe” to all Private Water Supply owners, alerting them to the risks of contamination of private water supplies with *E.coli* O157 and the steps which could be taken to protect these supplies. **We thought this very useful guidance and we recommended that the leaflet is revised and re-issued to all owners and users of private water supplies as soon as is practicable.**
- 7.30 There are many treatments available which will improve the quality of a water supply, including disinfection and UV filtration. We heard that many private supplies are untreated and where treatment procedures, e.g. UV filters are in place, they are often inadequate and poorly maintained.
- 7.31 We heard of research work currently being carried out by Strathclyde University into the use of high voltage pulses to liquids such as water which are able to destroy high levels of *E.coli* organisms. It was suggested to us that this could be a further effective treatment for private water supplies with the added advantage of low maintenance of the system.
- 7.32 We heard evidence of a sporadic case of *E.coli* O157 in a young child, living on a dairy farm, resulting in her death. Investigations revealed a number of potential sources for the infection including environmental and water. Although testing of the water revealed high levels of *E.coli* in the water supply, *E.coli* O157 was not isolated.
- 7.33 We also heard evidence of an outbreak of *E.coli* O157 occurring in Applecross in the North of Scotland in 1999 affecting 6 people, mainly children. The outbreak mainly concerned a campsite and also involved some cottages supplied with water from an untreated private water supply. Investigations of the incident identified likely contamination of the private water supply by sheep, possibly at the source of the supply.
- 7.34 Holidaymakers to the campsite were unaware their water was being supplied from a private water supply and that it was untreated, which is true of many similar situations. Control measures instituted by the health authorities at the time of the outbreak included, boil water notices, stockproofing of the source of the private water supply, shutdown of the private supply, installation of UV treatment and filtration and eventual transfer to a mains supply.
- 7.35 **We therefore recommended that**
- **Unless water is known to be of good quality then advice on boiling the water should be provided to all visitors etc.**
 - **Where high levels of coliforms and *E.coli* are detected within a private water supply whether to a single dwelling or to e.g. a campsite, boil water notices**

should be issued until steps have been taken to improve the quality of the water.

- 7.36 We were advised that information and advice contained within boil water notices issued in the event of the detection of *E.coli* O157 (and other pathogens) in a private water supply could vary widely throughout the various local authorities in Scotland. We thought this an area where consistent advice should be given on e.g. the use of water for brushing teeth, for handwashing etc. **We therefore recommended a standardised boil water notice be used by both Local Authorities and Water Authorities to ensure a consistent approach is taken throughout the country in the event of the detection of *E.coli* O157 in both private and public water supplies.**
- 7.37 In the incident described above, it was interesting to note that permanent local residents on the campsite supplied from the same water supply were not affected by *E.coli* O157, which raises the issue of ‘acquired immunity’, particularly within the farming and rural communities. We heard no evidence to support this but noted evidence from a prospective study of 80 dairy farm families in Ontario, conducted to examine transmission of VTEC from cattle to humans, that 6.3% of those tested had VTEC in their stools although infection was not associated with diarrhoeal disease. If such acquired immunity exists, it does not appear to extend to certain groups including young children, visitors, tourists, etc. who remain extremely vulnerable to infection from *E.coli* O157 (see paragraph 8.21).
- 7.38 Results from any testing carried out on water supplies will only give an indication of the quality of the water at the time the sample was taken and, particularly where the water is sampled infrequently, will not reflect the possible fluctuation in the quality of the supply.
- 7.39 We considered whether, if coliforms and *E.coli* were detected in the water supply, further testing should subsequently be carried out to determine if *E.coli* O157 was present. Coliforms and *E.coli* give a good indication of the quality of the water (at the time of sampling), and in light of the fact that *E.coli* O157 can be difficult to detect due to its sporadic distribution in water, we remain to be convinced that testing for *E.coli* O157 should be carried out when failures are detected. Nevertheless, **we recommended that testing for *E.coli* O157 be carried out if an association with either a private or public water supply is identified during the course of an outbreak or sporadic case of *E.coli* O157 and in addition that boil water notices are issued to all persons/properties on the supply. We judged it important that where testing for *E.coli* O157 is to be carried out in association with human illness, samples were sent to a laboratory with facilities to test by IMS, e.g. SERL.**

IMPROVEMENT NOTICES

- 7.40 Where water from a private water supply was found to be unsatisfactory, Local Authorities had to ensure measures were put in place to safeguard public health. This might include the issue of boil water notices and treatment of the supply with e.g. a hypochlorite solution. Local Authorities were encouraged to adopt an informal approach working closely with the owner to secure improvements to the supply.

- 7.41 Where this informal approach failed to secure improvements to the supply Local Authorities had the powers to require improvements to private water supplies failing to meet the quality standards. If they decided to use these powers an improvement notice would be served on both the owners, on whose land the source is located, and on the users of the supply. The notice set out the steps to be taken to improve the water supply. Where notices were not complied with the Local Authority might carry out the remedial works themselves and recover the costs from the owners and/or users.
- 7.42 We heard evidence from the Local Authorities that improvement notices were rarely used for the following reasons:
- The Local Authorities had no powers of prosecution where the owner of the supply refused to upgrade or improve the water supply as it is not an offence not to comply with a notice
 - The cost associated with the improvement works may be substantial and funding may not be available due to other competing demands on Local Authority budgets
 - The reasons for the failures must be fully investigated and a range of remedial works including connection to the mains must be considered
- 7.43 It seemed to us quite improper that the owner(s) of unsatisfactory supplies were not obliged to ensure this water met a satisfactory standard. We were of the view that improvement notices did not appear to be an effective means of securing improvement to these supplies and **we recommended that the Scottish Executive should consider measures to ensure unsatisfactory private water supplies are upgraded to an acceptable standard.**
- 7.44 It was suggested to us an alternative means of securing a satisfactory water supply would have been to include these as part of the requirements within the Building Regulations. At present new buildings served by private water supplies do not need to show the availability of an adequate or wholesome water supply to secure a completion certificate in terms of the Building Regulations. Private water supplies to new buildings are thus covered only by the statutory sampling regimes as set out in paragraph 7.18
- 7.45 It was also suggested to us that one way to raise awareness of the potential problems associated with private water supplies whilst securing necessary improvements to existing systems, for any private water supply to be included in a pre-sale survey.

MICROBIOLOGICAL RISK ASSESSMENT

- 7.46 The report by the WRc of the scoping study on *E.coli* O157 in water (paragraph 7.7) suggested further areas of research were required to clarify or reduce the risks associated with water. One area identified was the potential vulnerability of private water supplies to microbiological contamination in general, and a recommendation to develop a risk assessment approach to improve the source protection of private water supplies in relation to such microbiological threats.
- 7.47 We heard evidence of a microbiological risk assessment (MRA) approach which identified all the specific activities that were hazardous to the maintenance of good microbiological water quality at source. It was scored as either high, medium, or low risk, based on a presence/absence system e.g. whether a stock proof fence is present,

whether a vermin proof inspection cover is present etc. This model has given greater security of the identification of problems and improvements in the supplies. **We commended a risk assessment approach as a significant way forward in improving the integrity of water from private water supplies, and we recommended microbiological risk assessment should be included as a regulatory requirement.**

CONCLUSIONS

- 7.48 We did not identify any major deficiencies in the public water supply but noted the concern of supplies from high-risk catchment areas. A failure in any of the mains water supplies has the potential to affect a large number of people.
- 7.49 We were particularly concerned at the lack of monitoring and testing required and the high number of Category 1, Class F supplies (single dwelling) supplies failing to comply with drinking water standards. These supplies account for some 75% of the population (approx. 45,000) being served by private water supplies.
- 7.50 We were also concerned at the lack of motivation or apparent interest of some owners of private water supplies to take steps to protect and stockproof water sources from contamination either from livestock or from the spreading of agricultural waste. We thought this quite inappropriate, as improvements would involve little time, effort and minimal investment.
- 7.51 We were of the view that improvement notices were not an appropriate means of securing improvement of the microbiological quality of the supplies when failures or the water supplies occur.
- 7.52 We were encouraged by the development of microbiological risk assessment and saw this as a very practical means of assisting local authorities in identifying the risk areas for private supplies.

SUMMARY OF RECOMMENDATIONS

Public Supplies

- **The water authority gives particular attention to coliform and *E.coli* testing of water from a high risk catchment area. Where coliforms or *E.coli* were detected repeatedly in a supply, routine testing for *E.coli* O157 should be considered.**
- **Where a supply has had repeated coliform and *E.coli* failures and/or known treatment works failures immediate testing for *E.coli* O157 should be carried out and boil water notices issued as appropriate**

Private Supplies

- **The PEPFAA Code should also include a requirement for fencing off water sources e.g. springs, wells and boreholes and**
- **That the Scottish Executive should consider means of making this a mandatory requirement for private water supplies.**

- **The leaflet ‘Keeping it Safe’ is revised and re-issued to all owners and users of private water supplies as soon as it is practicable**
- **Unless water is known to be of good quality then advice on boiling the water should be provided to all visitors etc.**
- **Where high levels of coliforms and *E.coli* are detected within a private water supply whether to a single dwelling or to e.g. a campsite, boil water notices should be issued until steps have been taken to improve the quality of the water.**
- **A standardised boil water notice be used by both Local Authorities and Water Authorities to ensure a consistent approach is taken throughout the country in the event of the detection of *E.coli* O157 in both private and public water supplies.**
- **Testing for *E.coli* O157 be carried out if an association with either a private or public water supply is identified during the course of an outbreak or sporadic case of *E.coli* O157 and in addition boil water notices are issued to all persons/properties on the supply. We judged it important that where testing for *E.coli* O157 is to be carried out in association with human illness, samples be sent to a laboratory with facilities to test by IMS, e.g., SERL.**
- **The Scottish Executive should consider measures to ensure unsatisfactory private water supplies are upgraded to an acceptable standard.**
- **Microbiological risk assessment should be included as a regulatory requirement.**

CHAPTER 8

ACCESS & USE OF RURAL LAND

In this Chapter we:

- Consider policy and practice on access to rural land
- Assess the action needed to meet risks to certain activities
- Consider the needs of certain groups of people in the rural setting

8.1 An outbreak of *E.coli* O157 occurred in a Girl Guides camping trip on 1-3 June 2001 at a campsite near Inverkip, attended by 20 Guides and 4 leaders. This outbreak reinforced the relevance for this Task Force Report. Fifteen campers were ill and *E.coli* O157 was identified from 14 of them. Samples of the tap water supplying the camp and a nearby cottage, and faecal samples from the cows were found to contain *E.coli* O157. The organism appeared to be the same in the campers, cattle and the water. The campsite was supplied by a private water source. At the time of this report further investigations were continuing to identify the source of contamination.

INTRODUCTION

8.2 The potential for infection of humans by *E.coli* O157 from environmental sources had been known for some years. The principal source of the organism had also been widely observed to be from contact with, or cross-contamination from, farm animals and/or their faeces. The relationship between grazing animals and contamination of private water supplies in rural areas had been appreciated likewise for some time. The research findings published at the VTEC Open Forum in June 2000 and creation of our Task Force to take them forward, therefore, shifted significantly the focus from food-borne infection in past outbreaks to the circumstances of sporadic events now providing most of the cases of *E.coli* O157 infection in Scotland.

8.3 The shift to this new focus was one of the major reasons for constructing the widely, inclusive model for the Task Force, so that interests not frequently associated with discussion of pathogenic organisms could be brought into the dialogue in a constructive way. As explained at the beginning of this Report, we benefited from the corporate structure of the Scottish Executive in obtaining contact points, speakers, and information. As we looked closely at public access to rural land, the Executive was well advanced in preparing a consultation on its land reform proposals and, most significantly for us, its draft Outdoor Access Code.

ACCESS IN THE CONTEXT OF LAND REFORM PROPOSALS

8.4 The opening statements in the Task Force's work had suggested no great problem within the farming community in giving access for responsible behaviour by the public. However, such behaviour was dependent upon education and understanding by the public of activities carried out in the countryside, and an awareness of the part that they must play in avoiding damage to rural activities and in protecting themselves from potential sources of harm. We were advised of concerns among farmers that their custodianship and management of agricultural land would be somehow prejudiced by blanket permissions created within the land reform proposals.

- 8.5 When we came to consider these topics more closely, we were advised by the Executive that the proposals in law would be matched by an Outdoor Access Code, the contents of which were being prepared and consulted on in tandem with the legislation itself. We heard that the proposals would offer a general right of access to land and inland water for informal recreation and passage, subject to safeguards and responsibilities carried by the public themselves. Long-running debate had taken place in an Access Forum which, incidentally, would provide a very useful consultation mechanism itself for our work. Public consultation was planned to commence in February 2001 with the Bill entering the Parliament for debate after the Summer recess. It was hoped that the proposals would become Law early in 2002.
- 8.6 Farmers/landowners advised us of their general concerns over potential liabilities upon them resulting from the right of access that would be created by the proposed legislation. In the context of our work, therefore, this might relate to potential contact with animals or their manures or, perhaps, to consumption of water from contaminated burns and streams. Related to this was their concern whether access would be allowed freely over paths and tracks, open land and hill areas or also to enclosed fields and steading areas, where animals and animal waste might be found.
- 8.7 We heard that the proposed legislation would include a mechanism for landowners and managers to restrict temporarily the right of access for certain land management operations. We understood this provision to include obvious items such as lambing; but, for our interests, this might provide an opportunity for land managers to restrict access, say, after slurry or manures had been spread on land.
- 8.8 It was clear from the views obtained that a consensus over the wording of the Outdoor Access Code would be crucial to practical implementation of the proposals. Again, in relation to our interests, we noted that there might be requirements for signs and/or barrier fencing in certain circumstances, for example, where footpaths or established routes crossed or passed areas which were restricted or where, perhaps, special care was needed. Where a landowner had left a barrier strip free from slurry spreading, this might or might not be obvious to the passer-by. In certain cases, a marginal strip might be natural grassland left undisturbed by agreement as a safeguarded habit where intrusion by the public might be undesirable.
- 8.9 When the draft Land Reform Bill and draft Scottish Access Code were published for consultation in late February 2001 a number of preliminary uncertainties became clearer. The proposal would give a right of responsible access over land, enclosed or not, but excluding farm steadings. Decisions on period of temporary restrictions on access were given to landowners in the first instance, with recourse to Local Access Forums in cases where powers were abused. Local Authorities would have powers to enforce both access and restrictions.
- 8.10 We noted that the terms in which the draft Outdoor Access Code was written closely matched the approach adopted in our Interim Report and Guidance - both documents being published, incidentally, on the same day 22nd February 2001.
- 8.11 We saw parallels also between the approach to individual responsibility in the draft land reform proposals and our own thinking. In essence, existence of a hazard needed

to be made known to those exposed to it either on-site or by a process of education or information. Where hazards inevitably do exist – and there are hazards all around us in virtually every setting of life – owners/managers and users must accept that each has a part to play, in a spirit of mutual respect each for the other.

Some typical activities that might be affected by *E.coli* O157

- 8.12 For most people, the countryside is a place for recreation and enjoyment. However, it is also a place of work, including the management of open space, of farmed and wild animals, of growing crops and of agricultural recycling of mainly farm waste on to land for beneficial purposes.
- 8.13 Our concern is that the presence of pathogens, particularly *E.coli* O157, should be better understood by those present in the countryside, and that they are more aware of the things that they can do to avoid or diminish the risk to themselves and others from such organisms. In the discussion on action to avoid or minimise risk which follows we will deal separately with
- Those who live and work in the countryside
 - Those who pass through or visit casually or individually
 - Camping, picnicking and some sports
 - Use of public areas as showgrounds
 - Public access to farms
 - The seaside
 - The needs of specific groups, especially children

What the problem is

- 8.14 The source of the organism in animals, the spreading of animal waste on land and the implications for human health are dealt with in their respective chapters within this Report. In short:
- Research has shown that almost a quarter of cattle herds in Scotland and many sheep, goats and other wildlife carry and excrete *E.coli* O157
 - The animals do not become ill, but can spread the organism to people by direct contact and indirectly via droppings and manure spread on land
 - The farmer or landowner will not be aware of animals excreting *E.coli* O157, because the animals show no symptoms and there is no way of knowing when animals are infected
 - The danger is that such droppings may contain *E.coli* O157
- 8.15 As is stated elsewhere:
- Animal droppings on pasture are the greatest worry, especially where there are concentrations of animals in a given area, and in wet conditions
 - Land on which farm animal wastes or exempt industrial wastes have been spread may pose risk to some people, although a lesser risk than fresh animal droppings
 - Surface water run-off from fields containing animal droppings can lead to contamination of burns, streams, etc., particularly during wet conditions
- 8.16 Management of the risk of infection with *E.coli* O157 will also reduce the risks from other organisms present in animal faeces, such as salmonella and campylobacter.

- 8.17 **To be a risk, *E.coli* O157 has to be swallowed from contact with hands, contaminated food or contaminated water. Even tiny amounts of *E.coli* O157 can be a severe risk - as few as 10 organisms can cause serious illness in vulnerable groups of people, a very small quantity indeed compared to many other bacterial pathogens which usually require the presence of thousands of organisms to cause illness.**
- 8.18 When conditions are wet, contamination can spread more easily on to hands, footwear, tents, etc., with the increased possibility that the organism can pass into the mouth or contaminate food and water.

What we don't know

- 8.19 As described in Chapter 5 on “Animals & Environment: Understanding the Hazards”, we have insufficient understanding -
- Why the organism accumulates in the gut of ruminating animals
 - Why prevalence of the organism in animals is intermittent

The consequences of this are that

- There is no treatment that can be given directly to destroy the organism or inhibit its growth in animals
- It is not possible to vaccinate animals to prevent the organism developing
- It is impractical to monitor herds for the presence of *E.coli* O157 when the latter infects and clears from animals and herds/flocks in an apparently random fashion: presence of the organism on the day of testing would not justify action when the organism may be absent a day later

How risky is the countryside?

- 8.20 Since it is not possible to remove the organism from animals at present, it is inevitable that meantime we need to accept that the hazard of infection by *E.coli* O157 may be present to some extent in any land connected with the housing or handling of livestock. **Awareness of the presence of *E.coli* O157 is the first step in living with it safely.**
- 8.21 The degree of risk is dictated by factors described in Chapter 3 “Risk”. The “activity” risk factor is particularly variable in public access and the use of land, so we considered the risks from several likely activities separately.

What can be done

Those who live and work in the countryside:

- 8.22 We heard of no firm evidence of immunity from infection among farmers and their staff. We had noted, however, a recent study carried out in England which demonstrated the presence of antibodies to *E.coli* O157 in apparently healthy members within rural communities. The study suggested that people working with farm animals and people who may have had long term exposure to *E.coli* O157 may produce antibodies to this organism. Equally, we did not know of many cases of *E.coli* O157 infection in this group: families and visiting workers seemed to be more vulnerable.

E.coli O157 is a recent evolution: relying upon lack of cases in the past (within families, earlier generations, etc.) was therefore relying on false evidence. Farmers and staff would be protected to an extent by their personal protective equipment (PPE) and by good hygiene practice e.g. hand-washing. We noted that some handling activities can create a lot of animal-sourced dirt and therefore potential contamination on workwear which itself must be properly managed. We formed the view that farm workers would be conscious of the need to avoid contact between unwashed hands and the mouth, either direct or e.g. via pencils. **Nonetheless we recommended reiteration of advice to farmers at regular intervals. We further recommend that work is commissioned by SEHD to review infections among animal handlers.**

- 8.23 Those living on farms face less direct hazard than farm workers. They are exposed to the general farm environment but less to the animal source of *E.coli* O157. However, children can be at risk and we accepted compelling evidence of infection of a child from contact with e.g. a sheepdog. **We recommended greater care by workers in keeping working clothes, vehicles and working animals separate from children and domestic space.**

We considered separately the occupational risks of handling cattle in Chapter 9 “Food”.

Those who pass through or visit casually or individually:

- 8.24 Since *E.coli* O157 must be swallowed to be a risk, the act of passage through the countryside presents little risk. Walking, cycling, or horseriding are unlikely to provide direct contact between people and environmental sources of *E.coli* O157. There is a real risk of cross-contamination from droppings on the ground to footwear, tyres, and stirrups. However, most persons using the countryside in these ways for leisure just need to be alive to the risk and take care of personal hygiene.
- 8.25 **The individual, once alerted to the relatively low risk from passing through farming land, should be competent to take care on his own account.**
- 8.26 As has been mentioned earlier in this Chapter in relation to the Outdoor Access Code, certain activities might sensibly be accompanied by a temporary restriction in access, indicated perhaps by the presence of notices posted by the land manager. Livestock activities such as lambing are treated in this way to protect stocks from the public. The spreading of organic waste onto land might be treated in this way to protect the public from the risk of contamination.

Camping, picnicking and some sports:

- 8.27 The Task Force looked in detail at the circumstances of the Scouts Millennium Camp held at New Deer, Aberdeenshire in May 2000, at which 20 children became infected by *E.coli* O157. A summary of the circumstances is given in Annex 5.
- 8.28 We concluded that New Deer was an extreme case. Some 300 sheep had grazed the site for 6 days preceding the day of the Scouts’ arrival. Some individual animals were found later to be excreting exceptionally high rates (1 million organisms per gram) in droppings (!) and it rained heavily on the second day of the camp. Nonetheless,

monitoring this site in subsequent months has provided much useful information and has enabled some interesting analyses of decay rates in soil to be done.

- 8.29 The potential for individual high animal excretion rates was noted. We now have a clearer understanding of the survival of *E.coli* O157 in direct excretion in soil and hence of the desirable “withdrawal” between grazing and recreational use of pasture. Some of this information is given in paragraph 3.28
- 8.30 The activities of camping, picnicking and sports are grouped together because they all have potential to put contamination into the mouth. Washing and cooking at camp, picnicking on the ground and playing sport on pasture land all carry that risk. **We restate the interim guidance (Annex 7) issued by us in February 2001.**
- 8.31 We took advice from the Scouting Association and Guides in Scotland regarding typical arrangements for an organised camp, in particular because we wanted to provide especially for the future safety of young people. Referring again to the New Deer case, we were struck by the number of young (e.g. eight-year-old) children and would have been interested to know to what extent they had hygiene awareness and whether such good practice was maintained in the camp despite adverse weather conditions. The Scouts and Guides guidance to their leaders/members, which was reviewed immediately following the New Deer incident, provides general guidance, including personal hygiene. Naturally, it did not focus on specifics such as *E.coli* O157 and in any case there are potential difficulties in enforcing practices like personal hygiene in volunteer and peer-led provision. The Scouts and Guides opted to recommend personal hygiene requirements. In practice, we learned that their leaders took hygiene seriously and their organisations welcomed our interim guidance on recreational use of animal pasture.
- 8.32 We were concerned that adequate arrangements should be made for a safe water supply at such an event. On the face of it, campers would think that any piped supply should be fit for drinking. In practice, we know that such supplies could be from the mains or from a private source, or even from a field supply, i.e. intended for stock drinking water troughs.
- 8.33 We encouraged visitors to rural areas to confirm the safety of a water supply (see Chapter 7). Ideally, organised camping similarly should allow for this in the planning process. We sensed that checking a water supply hygiene is unlikely to be achieved as the result of it being difficult at a distance to ascertain who is responsible for ensuring quality of the supply. In this respect therefore we fell back upon our recommendation (Chapter 7, paragraph 7.34):
- placing greater onus on owners or managers of private supplies to ensure that a risk assessment is updated at regular intervals
 - those planning camping, etc. should check out the water supply as far as possible and consider a back-up (bottled supply)
- 8.34 We were advised that burns and streams were unlikely to be used for drinking, but we did worry at the risk of contamination from run-off from fields and we re-state, in particular, our interim guidance in this respect.
- Surface water run-off from fields and from farms containing animal droppings can lead to contamination of streams, burns, etc., particularly during wet conditions

- Ensure that water from burns and streams is treated before drinking

8.35 More is said in paragraph 8.53 below about the crucial needs of children.

8.36 Finally in this group of “at-risk” persons in the countryside are those who play sport in a field used for grazing - or indeed in a sports field grazed to keep the grass short. Potential contamination of land used, for example, by a rugby or shinty team will bring contact with hands, clothing and mouths into prospect, especially where the surface of the field is disturbed and especially in the wet. As we have noted before, children are particularly at risk and therefore **judgements need to be made about the nature of the activity and the age of players.**

8.37 Where the sporting use and grazing occur frequently or in rotation, the opportunity of withdrawal of stock prior to recreational use will be lost. Depending upon the intensity of stocking, a **judgement would need to be made regarding the presumption of the presence of *E.coli* O157.**

Use of public areas for festivals, rock concerts etc.

8.38 This is a similar scenario to camping and picnicking where animals may have had access to the land but would most likely have been removed prior to the event being held. There is therefore a risk of cross-contamination from faeces on the ground to footwear etc. We therefore restate the interim guidance (Annex 7) issued by us in February 2001.

Use of public areas as showgrounds:

8.39 This is the opposite scenario to the recreational use of animal pastures. Here animals are introduced for an event, after which the ground reverts to its usual purpose, perhaps public open space. The temporary use might be an agricultural show, sheep dog trials or a pony club event.

8.40 The presence of the animal source is likely to be brief - perhaps a day or two. **The period needed for decay of any contamination could be 3 weeks** (as for farm land in our interim guidance) **but, again, complementary actions can assist** e.g. removing obvious droppings after the event, cutting the grass and disposing of it, perhaps by composting it in a midden or heap fenced-off to prevent contact with people, and restricting uses of the ground in the decay period to those which are not likely to give contact with hands and mouths.

Public access to farms:

8.41 As the Task Force business got under way, reports were heard of concerns at the safety of visits to so-called “open farms”, by which we understood to mean premises which diversify into access by the public and which generally provide appropriate reception facilities for visitors. In response, those engaged in such activities represented the care invested in their operations and the commercial disadvantage being suffered through inappropriate presentation of risk. Both interests looked to the Task Force to take a well-informed and balanced view.

- 8.42 We were interested to note that Sweden had introduced a control policy which included recommendations about visitors to farms, control measures on farm, improved food hygiene measures and advising against children under 5 years of age visiting farms. These controls appear to have contributed to a decrease in the incidence of *E.coli* O157 in Sweden.
- 8.43 We did not gain figures of illness directly attributable to farm visits. Statistically, we expected the number of cases from such farm visits in relation to the large number visiting (approx. 235,000 in 2000) was a very small proportion. Indeed, we were rather surprised by the scale of this kind of operation.
- 8.44 In relation to the arrangements made for the reception of visitors, whether for social or for educational purposes, representatives of the open farms felt that their operations and standards were perceived unfairly by comparison, for example, with country parks operated by local authorities, some of which provided similar access to farm animals and therefore to comparable risks from *E.coli* O157. We heard that education authorities expect teachers to make a risk assessment of proposed visits by school classes and we were asked to consider how some central advice/procedure could be made available to teachers, to assist them to do this. Such a central guidance might also help the risks to be set properly in comparison to risks from, for example, beaches, public parks, leisure centres and swimming pools.
- 8.45 The Health & Safety Executive advice on open farms (paper AIS 23) was reviewed and strengthened in June 2000. Although this was aimed primarily at operators' obligations, e.g. under the Control of Substances Hazardous to Health (COSHH) regulations and the Health & Safety at Work Act, it was also very useful for those visiting. HSE provided a supplement specifically for the guidance of teachers.
- 8.46 **The Task Force formed an early view that visits to open farms continued to be a potentially valuable educational opportunity which should not be discouraged.** Direct contact with animals and with the farming environment clearly posed a potential risk, but we were made aware of the efforts of operators in providing facilities and supervision, so that the risk could be managed and minimised.
- 8.47 We noted the vulnerability of open farm operations to a combination of visitor numbers, visitor enthusiasm and their relative ignorance of the farm environment. In response to this, **we recommended that the operators' risk assessment has to be sound and its management of facilities and of visitors needs to be strict.**
- 8.48 We were considerably encouraged by the work of the Royal Highland Education Trust. This arm of the Royal Highland & Agricultural Society of Scotland advised us of their work with farmers, HSE, education authorities and schools, providing exactly the kind of support and guidance that seemed to us to be necessary. Significantly, the Trust was developing a risk assessment procedure for the use of farm managers and, potentially, teachers and others who were organising visits. This process was based upon an analysis of the operations on-farm, those areas accessible to the public and "no-go areas" excluded for operational and/or safety reasons. Pre-visits were encouraged and we perceived from the Trust no evidence of reluctance on the part of education authorities to restrict the opportunities for such visits where preparation and management of the event were seen to be sound. We understood that in England the

National Farmers Union is engaged in initiatives e.g. Farms and Schools in Partnership. RHET has kindly agreed to our attaching its draft risk assessment form at Annex 6

- 8.49 **The Task Force recommended that this approach, once fully developed and agreed could work for either an “open farm” or for a working farm giving occasional access, the risk assessment taking account of the circumstances of each scenario.**

At the seaside:

- 8.50 We wanted to look at the coastal/seaside environment as a form of recreational land use potentially at risk from sewage, dog dirt or seabird contamination, rather than by farm animals. A significant inspiration within the Task Force was the work of the Heather Preen Trust.
- 8.51 The origin of Heather’s Trust lies in a holiday taken by her family at Dawlish Warren, Devon where presumed contamination on the beach led to infection by *E.coli* O157 and, a few days later, led to Heather’s death. Heather was eight years old. The beach was identified as a common factor with other children affected at the same time, but we understand that the cause was not identified more specifically.
- 8.52 We noted the potential risks of diffuse pollution and in particular the recently completed study by SAC into the relationship between sources of pollution and bathing water quality in Ayrshire. The output was a set of recommendations to minimise pollution. As regards the beaches themselves, there was a theoretical risk also from animal (dog and seabird) fouling. In the absence of available work on that subject, **we recommended that publicity on bathing waters and beaches available by the Government, Water Authorities, Local Authorities and Keep Scotland Beautiful should include concerns for**
- **Vigilance by bathers in avoiding visible animal droppings**
 - **Consideration by animal owners in not adding to such pollution**
 - **Close attention by bathers to personal hygiene, especially in children**

Needs of specific groups, especially children:

- 8.53 Age was a major concern to us. The two main issues for us were of behaviour generally and of what we might call “hygiene competence”, by which we meant the developmental thresholds at which children gained an understanding of personal hygiene, risks around them, etc. We looked in vain for evidence of results of past work in this field, despite enquiries within the Health Service in Scotland and a literature search for us by the Librarian of the Royal College of Physicians of Scotland.
- 8.54 As in other parts of our work, the Task Force sought to make existing activities safer, rather than prohibit or unnecessarily restrict them.
- 8.55 We were advised that the following supervision figures in the HSE Guidance for visits to Open Farms (AIS23) were based upon supervision for a range of activities and might have to be revised in relation to particular circumstances such as increased microbiological risk.

1 to 1 for under 1 year olds
1 to 2 1-2 year olds
1 to 3 2-3 year olds
1 to 4 3-5 year olds
1 to 8 5-8 year olds

The Scouts Association in Scotland outdoor activities follow

1 to 4 for 6-8 year olds
1 to 6 for 8-10 year olds

The Guides follow

1 to 5 for 5-7 year olds

8.56 **We therefore recommend that the HSE guidance on level of supervision should be the minimum level required and in addition**

- **Where direct contact with farm animals is possible, children under five years of age are at greater risk and may need to be carried or more closely supervised**
- **Organised visits to farms or similar sites should first have a pre-visit by the organiser to assess the facilities and gauge where/if close supervision or restriction might be required**
- **Where numbers of children were to visit and close supervision could not be arranged, the participation of under-5s should be postponed to a separate, small-scale visit**

SUMMARY OF RECOMMENDATIONS

- **Reiteration of advice to farmers at regular intervals**
- **Greater care by workers in keeping working clothes, vehicles and working animals separate from children and domestic space**
- **Work should be commissioned by SEHD to review infections among animal handlers**
- **Place greater onus on owners or managers of private water supplies to ensure that a risk assessment is updated at regular intervals**
- **Those planning camping, etc. should check out the water supply as far as possible and consider a back up (bottled supply). In relation to burns and streams, be aware that**
 - **Surface water run off from fields containing animal droppings can lead to contamination of streams, burns, etc. particularly during wet conditions**
 - **Ensure that water from burns and streams is treated before drinking**
- **In relation to use of public areas such as show grounds, complimentary action can minimise the risk from animals**
 - **Remove obvious droppings after the event**
 - **Cut the grass and dispose of it e.g. fenced off for composting**
- **Visits to open farms continue to be potentially valuable educational opportunity which should not be discouraged**

- **In relation to open farm visits, the operators' risk assessment has to be sound and its management of facilities and of visitors needs to be strict**
- **That publicity on bathing waters and beaches available by the Government, Water Authorities, Local Authorities and Keep Scotland Beautiful should include concerns for**
 - **Vigilance by bathers in avoiding visible animal droppings**
 - **Consideration by animal owners in not adding to such pollution**
 - **Close attention by bathers to personal hygiene, especially in children**
- **That publicity on bathing waters and beaches available by the Government, Water Authorities, Local Authorities and Keep Scotland Beautiful should include concerns for**
 - **Vigilance by bathers in avoiding visible animal droppings**
 - **Consideration by animal owners in not adding to such pollution**
 - **Close attention by bathers to personal hygiene, especially in children**
- **The HSE guidance on levels of supervision should be the minimum level required and in addition**
 - **Where direct contact with farm animals is possible, children under 5 years of age are at greater risk and may need to be carried or more closely supervised**
 - **Organised visits to farms or similar sites should first have a pre-visit by the organiser to assess the facilities and gauge where/if close supervision or restriction might be required**
 - **Where numbers of children were to visit and close supervision could not be arranged, the participation of under-5s should be postponed to a separate, smaller scale visit**

CHAPTER 9

FOOD

In this Chapter we:

- Note recent years' food-borne cases and recent studies
- Review certain key foods in which particular risks might arise
 - Meat products
 - Raw milk and raw milk cheese
 - Salad/vegetable
 - Shellfish
 - Bottled water
- Look briefly at the issues of catering and farmers' markets

INTRODUCTION

- 9.1 As stated in Chapter 2 “Setting the Scene” much of the research work and case control studies commissioned by several Departments in 1997 was reported in June 2000. The results of this epidemiological research, made public at the Open Forum in Edinburgh, indicate that the majority of sporadic cases¹ of *E.coli* O157 are probably acquired from environmental sources. Hence much of this report concentrates on that route of infection.
- 9.2 Cases from the food chain had been mainly as part of outbreaks² and seemed to us to be an ongoing potential route of infection. However, we considered that *E.coli* O157 in the food chain had been well addressed by the ACMSF and Pennington Reports, and by the findings of the Fatal Accident Inquiry into the Central Scotland outbreak, all of which remained relevant today. A summary at Annex 10 outlines the implementation of the recommendations of the Pennington Group, ACMSF Report and the FAI findings in relation to food and abattoirs.
- 9.3 We therefore focused our attention on implementation of the findings and recommendations of those reports and, on key commodities which we felt did merit further consideration. The key foods considered by us were salad crops and vegetables, raw milk and raw milk cheese, meat, bottled water, and shellfish. Generic issues studied by us included farmers markets and catering establishments.
- 9.4 *E.coli* O157 was first identified as a cause of human illness in 1982 in patients affected in 2 outbreaks of bloody diarrhoea in the USA, both associated with eating insufficiently cooked hamburgers. There had been numerous reports worldwide since then of infection with the organism from food sources. Most outbreaks of *E.coli* O157 in the UK have affected fewer than 10 people and have been associated with a variety of foods including burgers, cheese, milk, meat and water. Two of the largest outbreaks to occur in Scotland were in 1994 in West Lothian, when more than 100 people were affected after consuming contaminated pasteurised milk; and in 1996 in Central Scotland when almost 500 people were affected after consuming meat products from a

¹ Single cases of disease apparently unrelated to other cases.

² Two or more linked cases of the same illness.

butchers shop in Wishaw and which were found to have been widely distributed throughout Central Scotland.

9.5 The reported modes of transmission for outbreaks in Scotland from 1996 – 2000 are shown in Figure 9.1

Figure 9.1
General outbreaks of infection with *E.coli* O157 identified by SCIEH surveillance system 1996 – 2000

Year	Case numbers	HB	Location	Number Ill	Total Ill & Positive	Main Mode of Transmission	Suspect vehicle or environmental source
1996	Total all cases = 506	FV	Sports club premises	2	2	Foodborne	Burger
		GG	Nil return	N/K	N/K	N/K	N/K
	Total outbreak cases = 284	LO	Nil return	N/K	N/K	N/K	N/K
		LO	Nil return	N/K	N/K	N/K	N/K
		AA	Nil return	N/K	N/K	N/K	N/K
		HG	Private house	3	3	Multiple	N/K
		Var	Butcher's shop	512	279	Foodborne	Cold & other meats
1997	Total all cases = 422	BR	Pub	6	6	Foodborne	N/K
		TY	Residential institution	25	21	Foodborne	N/K
	Total outbreak cases = 91	BR	Village hall Burns Supper	7	7	Multiple	Trifle/water?
		BR	Butcher's shop	15	15	Foodborne	Cold meats & paste
		LO	Nil return	N/K	N/K	N/K	N/K
		HG	Farm	5	5	Person to person	N/A
		GG	Country park	6	5	Other (zoonoses)	N/A
		GR	Residential institution	5	5	Multiple	N/K
		FV	Hospital	37	12	Foodborne	Home baking
		GR	Community	12	9	Waterborne	Private water supply
		TY	Residential institution	3	2	Multiple	N/K
LN	Community	26	4	Multiple	N/K		
1998	Total all cases = 217	LN	Residential institution	12	2	Multiple	N/K
	Total outbreak cases = 16	GG	Restaurant	10	8	Foodborne	Salad
		GR	Private house	4	4	Foodborne	Cheese
1999	Total all cases = 294	FV	Farm	3	3	Multiple	Raw milk
		GG	Butcher's shop	3	3	Foodborne	Cooked meat
	Total outbreak cases = 43	GR	Primary school	27	22	Foodborne	Goats cheese
		FF	Private house	8	4	Person to Person	N/A
		FF	Private house	3	3	Multiple	Barbeque food
		HG	Campsite	7	6	Waterborne	Private water supply
		OR	Nil return	N/K	N/K	N/K	N/K
		FF	Residential institution	4	2	Person to Person	N/A
2000	Provisional total all cases = 200	FV	Farm	2	2	Environmental	Unpasteurised milk
		GR	Scout camp	70	20	Environmental	N/K
	Total outbreak cases = 31	DG	Caravan park	2	2	Foodborne	Chicken
		FF	Community	10	4	Person to Person	N/A
		LO	Scout camp	4	3	Environmental	N/K

Total outbreak cases were those cases associated with an outbreak. Total cases also include sporadic case

- 9.6 Despite work done after ACMSF and Pennington to improve knowledge, training practices and controls, the food chain still remained at risk from *E.coli* O157. This was demonstrated, for example, by the outbreak in 1999 in Macduff when 24 children and 3 adults were affected after consuming contaminated cheese.

EPIDEMIOLOGICAL STUDIES AND SURVEYS

- 9.7 A case control study on cases of sporadic infection of *E.coli* O157 carried out in Scotland from 1996-1999 did not identify any specific food or tap water as a risk factor. Another case control study of sporadic cases of *E.coli* O157 carried out in England and Wales from 1996-1997 concluded that eating food bought from stalls etc. was a major risk factor. A study carried out in Wales demonstrated that *E.coli* O157 infection was associated with the consumption of beefburgers from a catering premises other than a particular fast food chain and with consumption of cold cooked meats from caterers, but not from butchers.
- 9.8 A survey of the prevalence of *E.coli* O157 in raw meats, raw cow's milk and raw milk cheeses was carried out in South East Scotland from April 1997-March 1999. This arose from a recommendation in the ACMSF "VTEC" Report. Results demonstrated that contamination of raw retail meats, raw cow's milk and raw milk cheeses was uncommon in SE Scotland, with only 2 out of a total of 829 beef samples positive for *E.coli* O157. The organism was not isolated from either raw milk or cheese manufactured from raw milk.
- 9.9 We heard evidence of similar findings in routine surveillance studies of food carried out by the Public Health Laboratory Service (PHLS) in England and Wales. *E.coli* O157 was isolated only 16 times from 28,287 survey samples taken between 1994 and 2000. It was never isolated from any cooked foods, only from raw cow's milk (3 of 1205 samples), raw meats (3 of 2330 samples), burgers (3 of 1015 samples) and surfaces (4 of 4635 samples).
- 9.10 Despite the widespread prevalence of the organism in the animals, there are relatively few reports of *E.coli* O157 in food. We noted the view of the PHLS that untargeted routine food surveillance was an inefficient way to determine the risks from *E.coli* O157 in foods compared to focussed targeted surveys. **We recommended that it would be more appropriate and effective to focus *E.coli* O157 monitoring in foods to situations where biological plausibility allowed for a targeted well defined study or where there was suspicion or association with an outbreak.**

THE REGULATORY POSITION

- 9.11 Legislation relating to food is both numerous and complex. Much of it is governed by European Union legislation which is subsequently interpreted into Scottish regulations. The main empowering legislation in the UK is the Food Safety Act 1990³, which empowers Ministers to make detailed regulations for separate topics or foodstuffs. A list of the legislation with full references is provided in "Food Law in Scotland"

³ In a few cases authority comes from the European Communities Act 1972

(available from FSA). A list of the legislation relating to the foods discussed in this Chapter is included in the bibliography at Annex 13.

Hazard Analysis and Critical Control Points (HACCP)

- 9.12 HACCP is a structured approach to analysing the potential hazards in an operation, identifying the points in the operation where the hazards may occur and deciding which points are critical to control to ensure consumer safety. These critical control points (CCPs) are then monitored and remedial action taken if conditions at any points are not within predetermined limits. These things are then documented as part of the process.
- 9.13 The European Union (EU) food law places the responsibility for ensuring the safety and protection of the consumer very firmly with individual food businesses. HACCP based principles provide a tool for food businesses to address this responsibility and these principles are backed up in law by prescriptive requirements and provisions requiring enforcement.
- 9.14 The advantages of the HACCP approach are now internationally recognised, through the Codex Alimentarius Commission⁴, which agreed that HACCP is based on 7 principles and includes a requirement for documentation of all procedures.

KEY FOODS STUDIED

- 9.15 Since the time of the Central Scotland outbreak, much work has been done within the food industry to improve hygiene conditions within slaughterhouses, in meat production premises and butchers shops. As mentioned earlier an outline of the status of the implementation of the recommendations of the Pennington Group, ACMSF and the findings of the Fatal Accident Inquiry into the Central Scotland Outbreak is given at Annex 10. Almost all of the required actions had been taken, as shown in the Annex. A small outstanding remainder are discussed below.

MEAT

Clean Livestock Policy and Slaughterhouses

- 9.16 Both the Pennington and ACMSF reports recommended greater training for abattoir workers and promotion of good practice in slaughterhouses. Pennington also recommended the urgent implementation by the MHS of its scoring system for clean/dirty animals and clearly stated that there had to be rigorous enforcement by the MHS at the abattoir 'of the absolute requirement for the presentation of animals in an appropriate, clean condition for slaughter.'

⁴ An international organisation, created by the World Health Organisation and the Food and Agriculture Organisation of the United Nations, which sets standards for food.

- 9.17 We debated at length the issues surrounding the implementation of the Policy, one of the main recommendations of the Pennington Group. Clean Livestock Policy guidelines were initially drawn up to assist Meat Hygiene Service (MHS) staff in the categorisation of levels of hide and fleece contamination and to advise on the action to be taken for each category.
- 9.18 We heard evidence from the industry that the principles of the Clean Livestock Policy have been fully endorsed by them and this was now one of the main critical control points (CCPs) of the slaughtering process.
- 9.19 We were challenged that the policy was based on science, and whether it was actually contributing to an improvement in microbiological standards with a resulting improvement in the production of clean cattle carcasses. We were referred to photographic evidence of injuries sustained by farmers and farm workers when carrying out belly clipping of cattle to ensure the animals reached the standard acceptable on presentation for slaughter. We therefore reviewed scientific papers on research work carried out in Scotland, Finland and Canada into the relationship between cattle cleanliness and carcass contamination.
- 9.20 We noted research carried out in Canada, which looked at the association between tag (mud, bedding and manure) on hides of beef cattle at slaughter and bacterial deposition on carcasses. This work failed to find a direct association between tag on hides and bacterial counts on carcasses.
- 9.21 We also noted research work carried out in Scotland which assessed what effect, if any, the level of mud, faecal and bedding contamination present in the animal coat at the time of slaughter had on microbiological cleanliness. Findings from this research indicated that the MHS Clean Livestock Policy was being effective in delivering clean cattle for slaughter. No cattle sampled in this survey fitted the MHS category 4 or 5 (heavy contamination), with only 10% fitting the category 3 description, which limited statistically valid comparisons. The small numbers of category 3 animals returned carcasses with a higher percentage of *E.coli* bacteria. This work suggested a correlation between CLP and lower bacterial load. It was evident however, that clean animals could return some very high levels of *E.coli* bacteria, perhaps because of less stringent processing controls of carcasses which were not destined for the food chain.
- 9.22 Work carried out in Finland showed that a solid layer of dung on cattle hides led to considerably greater microbial contamination of the carcasses.
- 9.23 We also noted research carried out in the UK into the effects of fleece soiling on the microbiology of sheep carcasses. It demonstrated that those sheep with longer fleeces may have had the potential to hold a greater number of bacteria, and a higher potential for contact with the carcass leading to an increase in the microbiological loading of the carcass. Other research work on sheep suggested that visual assessment of sheep cleanliness did not relate to bacterial load with a major cause of carcass contamination found to have been caused by poor handling practices during dressing.
- 9.24 Our assessment of the above papers led us to suggest, on balance, that there is a correlation between clean/clipped cattle and sheep and resulting microbiological

standards of cattle carcasses but the evidence is not strong and therefore not a decisive correlation.

- 9.25 However, the Clean Livestock Policy remained a practical, deliverable procedure. Cattle were now being presented for slaughter in a clean condition and, the aim was to promote contributory actions towards good hygiene in the abattoir. The CLP remained worthwhile.
- 9.26 In terms of proportionality, it was clear to us on the grounds of health and safety that carrying out the procedure of belly clipping on cattle was not an accepted safe practice unless proper protective equipment was being used. We were of the view that, unless this procedure could be carried out in a safe manner, we could not condone a practice which could, in some circumstances, seriously endanger the health of the operator. The CLP guidelines state that the animal has to be presented in a clean condition for slaughter. We noted that clipping was one of several options for promoting cleanliness of animals. If cattle were so dirty that clipping was the only practicable response, perhaps the farming and meat industries might give some thought to the means by which cleanliness could best be achieved by the use of safe methods at an earlier stage e.g. by better bedding, or some other means, to ensure the animals are presented in a cleaner condition.
- 9.27 A further recommendation of both the Pennington Group and the ACMSF was to adopt the principles of HACCP and enshrine this in legislation governing slaughterhouses and the transportation of carcasses and meat. The EU has recently approved amending legislation that would require operators in slaughterhouses to introduce procedures based on HACCP principles within one year. Small meat establishments may be allowed up to 2 years to meet these new requirements.
- 9.28 We were greatly encouraged by this recent proposal and supported this move from prescription to a risk-based system of official inspection and supervision. We believe that such an approach will help to minimise the risk to consumers of *E.coli* O157 from raw meat. We understood that slaughterhouses were now working towards the introduction of HACCP.

Meat Products

- 9.29 The Pennington group heard how the application of The Meat Products (Hygiene) Regulations 1994 were complex and confusing to both the enforcement authorities and trade. They considered the guidance issued to accompany the regulations went beyond the terms of the regulations resulting in some premises which should have been approved under the more restrictive Meat Products Regulations being covered by the less prescriptive General Food Hygiene Regulations 1995.
- 9.30 A recommendation of the Pennington Group and one of the findings of the FAI was that the Government should review the application of the Meat Products (Hygiene) Regulations 1994, and the guidance issued subsequently, to clarify the position regarding which premises are intended to be covered by the regulations.
- 9.31 We were disappointed to note that those regulations have not been reviewed and that there has been no updated guidance issued to clarify which premises should be covered

by them. The Sheriff Principal in his findings of the FAI noted the confusion of the guidance.

- 9.32 However, although it is now 4 years since that meat products recommendation was made, licensing of butchers shops has been implemented, with effect from October 2000. That will have given the Local Authority the opportunity to reassess the status of butchers/meat products premises. The only premises now not covered by specific requirements would be butchers and other meat premises selling only raw meat. **Nonetheless, we recommended that the application of the Meat Products Regulations should be reviewed and clarified.**

Butchers Licensing

- 9.33 The Pennington Group did not consider the General Food Hygiene Regulations 1995 to be sufficiently prescriptive to permit enforcement in some key areas and recommended the introduction of selective licensing arrangements for premises not covered by the above-mentioned Meat Products (Hygiene) Regulations 1994. Regulations were brought into force in Scotland in May 2000 to require all butchers handling unwrapped raw meat and ready to eat foods to be licensed by October 2000 (The Food Safety (General Food Hygiene) (Butchers Shops) Amendment (Scotland) Regulations 2000).
- 9.34 The Pennington Group recommended that a licence be issued on the basis of the owner of the butchers premises having either a full HACCP system in place or ensuring physical separation between raw meat and unwrapped cooked meat/meat products and ready to eat foods.
- 9.35 The Butchers Licensing Scheme has now been implemented in all butchers shops throughout the UK. In Scotland approximately 75% butchers are licensed on the basis of HACCP and approximately 25% are licensed on the basis of physical separation between raw meat and unwrapped cooked meat/meat products and other ready to eat foods. In England and Wales, a butchers licence is issued only on the basis of the owner of the premises having a full HACCP system in place.
- 9.36 The FAI into the Central Scotland outbreak asked for consideration to be given to cold cooked meats being produced only in licensed premises dedicated to that single purpose. It was considered that this would be adequately covered by the introduction of the Butchers Licensing Scheme.

Minced Meat Products including Burgers

- 9.37 One of the largest outbreaks of *E.coli* O157 infection occurred in the USA between 1992 and 1993 affecting 732 people and was associated with the consumption of inadequately cooked beefburger patties. Two outbreaks in Fife and Lothian in 1994 were also associated with the consumption of burger meat. The study carried out in Wales (see paragraph 9.6) demonstrated the association of the consumption of beefburgers from catering premises and *E.coli* O157.
- 9.38 We noted that the mincing process of burgers allowed any organisms that might be present on the surface of the raw meat to be distributed throughout the product,

therefore, burgers and other minced meat products pose a greater hazard than intact joints of meat.

- 9.39 The Task Force heard evidence from a large restaurant chain whose company had enshrined HACCP within its hygiene policy throughout the food chain from slaughtering (including the presentation of clean animals for slaughter) through to the point of consumption to ensure a 'safe' product is presented to the customer.
- 9.40 The ACMSF report considered in some detail the problems associated with the cooking and handling of burgers. Its advice, updated in the light of experience, was targeted to several audiences. For manufacturers and retailers it mentioned that burgers should be cooked to a minimum internal temperature of 70°C for 2 minutes or equivalent and that cooking instructions comply with this. For consumers, it advised that burgers and similar minced meat products were thoroughly cooked so that they were piping hot throughout. Undercooked burgers that were rare in the middle were stated to be potentially dangerous. The outbreaks described above would probably have been prevented if there had been adequate or effective cooking of the burgers and we were strongly of the view that the risk of food poisoning from *E.coli* O157 through inadequate cooking of burgers (or any food) remained a threat.
- 9.41 We strongly endorsed the ACMSFs recommendations that burgers should be thoroughly cooked and **recommended that the ACMSF message continue to be reiterated at frequent intervals, not least throughout the 'BBQ' season.**
- 9.42 We saw a recent development of a single-use disposable thermometer, which could indicate, it was claimed, when meat products have been adequately cooked and showed a colour change at 75°C. We judged that temperature was likely to meet the ACMSF recommendation of 70°C for 2 minutes. We welcome this kind of innovation to produce simple, easy to use, inexpensive methods, which would assist in ensuring the adequate cooking of beefburgers.

Raw Milk and Raw Milk Cheese

Raw Cows Milk

- 9.43 Compulsory pasteurisation of raw cows drinking milk and raw cream has been a requirement in Scotland since 1983 and was considered to be a proportionate response to control a problem in a foodstuff distributed over a large geographical area. Figure 9.2 below demonstrates the number of cases of food poisoning both prior to and after the introduction of compulsory pasteurisation. This illustrates that the risk to the general population has been considerably reduced although people living/working on farms and drinking raw milk are still at risk.

Figure 9.2

OUTBREAKS OF FOODBORNE DISEASE IN SCOTLAND ASSOCIATED WITH RAW MILK 1980-2000

Year	Number of Outbreaks	Numbers Affected By Illness (Deaths)
1980	3	98 (4)
1981	8	782 (3)
1982	14	539 (1)
1983*	7	29
1984	5	27
1985	8	74
1986†	2	10
1987	5	30
1988	1	4
1989	0	0
1990	2	6
1991	4	17
1992	2	6
1993	0	0
1994	0	0
1995	No reports received	-
1996	0	0
1997	0	0
1998	0	0
1999	1	3
2000	1	2

* The Milk (Special Designations) (Scotland) Order 1980 was implemented on 1 August 1983.

† The Agricultural Wages Order NO. 34 (under the Agricultural Wages (Scotland) Act 1949) was implemented on 1 September 1986.

These outbreaks occurred on farms

NB The above table does not include the two cases of illness associated with goats in Scotland during 1996.

Source of Information: SCIEH

- 9.44 The Task Force was asked to focus mainly on issues pertaining to the Scottish situation. It could draw upon relevant expertise or experience from further afield and plan for its findings to be applicable potentially beyond Scotland. The Task Force received representations from the Scottish Food Co-ordinating Committee (SFCC) and HUSH, and support once more from ACMSF, that compulsory pasteurisation of raw cows milk should be introduced in England and Wales. We therefore noted that the sale of raw milk and raw cream in England, Wales and Northern Ireland, was still permitted to be sold directly from the farm gate or to be delivered direct to the doorstep. We noted also the recommendations in 1995 by the ACMSF which strongly urged the Government to reconsider its position concerning a ban on the sale of raw cows milk in England, Wales and Northern Ireland.
- 9.45 A consultation on prohibiting the sale of raw cows milk was carried out in England and Wales in 1997. The consultation received strong consumer representations against this proposal, in consequence of which Ministers agreed continuation of the sale of raw cows milk. The Government subsequently introduced the compulsory labelling of raw cows milk with a health warning advising consumers of the associated risks.
- 9.46 There is an obvious difficulty over regulating for specific customer groups and of enforcing the provisions made under such regulation. The alternative - giving guidance, information and education - sustains the availability of free choice. That is

itself a desirable objective where the policy is matched successfully by good consumer information and consensus. This solution does place a heavy responsibility upon those who supply, support or care for those in vulnerable groups to ensure that the interests of susceptible individuals are given due weight when decisions are made to purchase a commodity which has the potential to pose a statistically high risk.

Figure 9.3

**Escherichia coli O157 general outbreaks associated with milk
England and Wales 1992-2000*~**

Year	Location	No. ill	No. +ve	Suspect vehicle
1993	Farm	6	5	Unpasteurised milk (M)
1996	Community	6	4	Milk (M)
1996	Community	12	12	Milk (D)
1997	Farm	8	6	Unpasteurised milk (D)
1998	Milk round	3	3	Raw milk, cows (M)
1999	Milk round	114	111	Milk sold as pasteurised (S)
1999	Retailer	9	11	Milk sold as pasteurised (D)
2000	Farm	4	4	Unpasteurised milk (M)
2000	School	2	2	Unpasteurised milk (M)

Source: PHLS

Figure 9.4

**Escherichia coli O157 general outbreaks associated with dairy products excluding milk
England and Wales 1992-2000*~**

Year	Location	No. ill	No. +ve	Date of onset	Suspect vehicle
1997	Cheese Manufacturer	5	4	05/10/97	Unpasteurised cheese (M)
1998	Farm shop	7	7	20/09/98	Unpasteurised cream (D)
1999	Cheese producer	3	3	Feb 99	Cheese (M)

(M) Microbiological: identification of an organism of the same types from cases and in the suspected vehicle, or vehicle ingredient(s).

(S) Statistical: a significant statistical association between consumption of the suspect vehicles(s) and being a case.

(D) Descriptive: other evidence, usually descriptive, reported by local investigations as indication the suspect vehicle

*Provisional

~Outbreaks where the minimum data set has been returned

Source: PHLS

9.47 No accurate figures were available of the actual quantity of raw cows, sheep and goats milk being sold although the number of producers in England and Wales licensed to sell raw cows milk direct to the consumer has decreased from over 600 in 1997 to currently below 350 producers. We were concerned to note the outbreaks in England and Wales associated with the consumption of raw milk and raw cream – Figures 9.3 and 9.4 above, in particular the outbreak at a school.

On balance, we therefore recommended all raw drinking milk and raw cream for sale for consumption in that state in England and Wales should be heat treated.

Raw Sheep and Goats Milk

9.48 New regulations are currently proposed which would prohibit the sale of raw sheep and goats milk for drinking in Scotland. In England and Wales there were no such restrictions on the sale of raw sheep and goats milk, which was still permitted to be sold at retail level. Although there were no proposals to change this situation, there were

proposals to extend the health warning currently applicable to raw cows milk to raw sheep and goats milk.

9.49 The risk-based approach suggested in respect of raw cows milk (paragraph 9.46 above) applied similarly in relation to raw sheep and goats milk. We understood that there was little or no sheeps drinking milk sold or consumed. As regards goats milk, we did not know the extent of current sales or consumption of the raw commodity but believed it to be relatively small. Again, our priority would go to the vulnerable groups. There were 2 factors that we felt were relevant in this case :-

- (1) Whether distribution was widespread, in the sense that there was production and/or demand widely across the country(ies). In England, where distribution to retail outlets is allowed, there could be a larger-scale problem of traceability and enforcement in the event of a problem and heat treatment could be a proportionate response.
- (2) We understood that some of the demand for raw goats milk resulted from the perceived benefit to those who were intolerant of cows milk, where heat-treated goats milk could confer the same benefit.

9.50 **On balance we recommended that raw sheep and goats milk for sale for drinking in England and Wales should be heat treated.**

Raw Milk Cheese

9.51 Although the sale of raw milk was not permitted in Scotland, the manufacture of cheese made from raw milk was still allowed throughout the UK. There have been 2 outbreaks of *E.coli* O157 in the Grampian area, associated with the consumption of cheese manufactured from raw milk - a community outbreak in 1994 (circumstances described in paragraph 2.26) which affected 22 people and the Macduff incident in 1999 (circumstances described in paragraph 2.32) which affected 24 children and 3 adults. There has also been a recent case in England and Wales associated with the consumption of raw milk cheese – see figure 9.4.

9.52 One of the problems identified in 2 of the outbreaks of *E.coli* O157 associated with cheeses manufactured from raw milk (Grampian 1994 & England 1999) was the difficulty in the subsequent identification and traceability of the product, particularly at retail level, when the product had to be recalled.

9.53 Following the outbreak in Grampian associated with the consumption of raw milk cheeses, The Specialist Cheesemakers Association made the major contribution to the Specialist Cheesemakers' Code of Best Practice, developed to assist cheesemakers and enforcers to better understand the risks associated with the process of cheese manufacture, and legal obligations. The Code also recommended clear labelling of raw milk cheeses at retail. This Code was reviewed last year and a recommendation made that cheesemakers and retailers should improve the traceability of their product.

9.54 We heard of a recent survey, in which a third of the cheeses on sale at retail level did not identify whether they were made from raw or pasteurised milk. We were of the

view that consumers should be given adequate information on whether the product is pasteurised or made from raw milk and on the risks associated with its consumption.

- 9.55 A study of *E.coli* in unpasteurised cheeses on retail sale, carried out by MAFF in 1997, did not identify *E.coli* O157 in any of the 801 samples from throughout the UK. Nonetheless, we remained concerned at the number of outbreaks of *E.coli* O157 associated with the consumption of raw milk cheeses and the risks associated with them. **We therefore recommended that:**
- **The recommendations on traceability in the Report on Small Scale Cheese Production in Scotland are implemented by the FSA**
 - **Cheese made from raw milk should be clearly identified at retail level to permit the consumer to make an informed choice**

Salad and Vegetable Crops

- 9.56 With particular interest in the environmental routes of contamination, we perceived that salad crops and vegetables (including those organically produced) consumed in their raw state, remained an area which could pose a potential risk from *E.coli* O157 through contamination from water supplies, from manure or from poor handling practices. Salads and vegetables were now sold in various ways at retail level e.g. loose, prepacked, etc. We thought it important that the consumer would recognise the distinction between raw vegetables/salads, prepared vegetables (prepacked, ready to cook) and prepared salads (prepacked, ready to eat). **We recommended that clear labelling/instructions for ready to cook/eat salad vegetables were required and should be supported by regulations.**
- 9.57 We received no evidence to suggest there was any greater risk of *E.coli* O157 from organic salad crops and vegetables. We noted an outbreak of *E.coli* O157 in 2 families from the handling of potatoes covered in dung and we remained concerned that improper use of manure could cause the transfer of *E.coli* O157 on to salad crops and vegetables, resulting in a risk to human health, particularly where they were to be eaten raw. We understood that standards for organic crops which were set by the Soil Association advised that raw manure should not be applied directly to or immediately before growing salad/vegetables and required composting of organic waste (manure) and storage of the waste for a period of 3 months. **We therefore recommended that growers of salads/vegetables to be eaten raw should be advised on the correct handling of organic wastes.**
- 9.58 Water could also be a potential source of contamination and growers should ensure that the water used for irrigation of growing crops or for washing of the salads/vegetables was safe for use (potable).
- 9.59 The Task Force were encouraged to note the employment of the European Food Standards Inspection Service (EFSIS) by the major retailers to monitor and audit both home suppliers and suppliers of imported produce.
- 9.60 We wanted a snapshot of practice at retail level. The Task Force therefore heard evidence from a larger retail company and we were greatly encouraged to note the strict controls put in place by them for salads and vegetables from the growing of the crop right through to the distribution and retail stage. They also impressed upon us the

importance of training of the handlers of hand-harvested vegetables and salad crops and the requirement for adequate toilet facilities to be provided for those working in the field. We returned again to the provision of adequate toilet and hand washing facilities and we considered personal hygiene an important factor, particularly where salad crops and vegetables were intended for consumption in their raw state. **We therefore recommended that adequate training be made available and undertaken by all of those involved in the preparation, handling and distribution of salad and vegetable crops.** We were made aware of routine surveillance by PHLS of the isolation of salmonella from ready to eat salads.

- 9.61 We believed that many of the smaller businesses may also have similar controls in place. Nonetheless, we remained concerned that some businesses might not have the facilities or the staff to ensure even the minimum of controls are effected and **we recommended that**
- **All salad/vegetables to be consumed in their raw state, even though pre-washed, should be washed prior to consumption**
 - **An education programme be targeted at smaller businesses, caterers and consumers on the need for a high standard of personal hygiene and for effective washing of all ‘raw’ salad and vegetable products prior to sale and consumption**
- 9.62 It was suggested to us that products such as beansprouts and mustard cress might pose a risk of contamination and hence *E.coli* O157, because of their ideal conditions for the growth of *E.coli* O157 if the seed is contaminated. We noted 2 large outbreaks of *E.coli* O157, one in 1996 in Japan affecting more than 9500 people and resulting in 10 deaths thought to have been associated with the consumption of radish sprouts, and another in the USA in 1997, which affected over 80 people and was associated with the consumption of alfalfa sprouts. No evidence of poor hygienic practices were identified during the investigation by the relevant authorities but the seeds were considered to be the source of the outbreak.
- 9.63 We remained concerned that there may be a lack of awareness of the need for strict controls in both UK and imported products during handling, storage and distribution. **We therefore recommended that correct handling procedures for sprouted seeds were included as part of the above education campaign.**

BOTTLED WATER

- 9.64 During the time the Task Force convened, we were made aware of one coliform problem in bottled water thought to have been as a result of the recent flooding in the catchment area. We heard evidence from a major manufacturer of bottled water of the extensive controls they currently have in place to reduce the risk of *E.coli* including strict controls on the use of animal waste and grazing of animals in or near the catchment area, extensive microbiological and environmental sampling and testing, the use of filtration and the requirement of a 3-day positive release system.
- 9.65 It was suggested to us that there could be widely differing quality standards used throughout the industry, with no means for the consumer to differentiate between them. We commend microbiological testing and the use of a positive release system.

- 9.66 The case control study carried out in Scotland suggested that the consumption of bottled water could be a protective factor against infection with *E.coli* O157. The reasons for this are not clear but could reflect socio-economic factors which would influence consumers of bottled water.

Shellfish

- 9.67 It was initially suggested to us that shellfish could pose a potential risk to public health from *E.coli* O157. We did note the recent detection of *E.coli* O157 in an oyster in France which demonstrated that shellfish could be a potential source of *E.coli* O157 if the waters used for growing and harvesting become contaminated. However we noted also the results of a survey by the Marine Laboratory, Aberdeen and the University of Aberdeen which did not detect *E.coli* O157 in any of the 200 samples taken from around the Scottish waters. We understood that further work continued in this area of research.

FARMERS' MARKETS

- 9.68 A fairly recent addition to the marketing of food has been the setting up of farmers' markets in certain centres in Scotland. These have been common in England for many years but have only recently begun to thrive in Scotland. We were initially concerned that standards of hygiene might not be as well established or as rigorously enforced in these markets as they are elsewhere in the food chain.
- 9.69 We heard evidence from an enforcement authority and from a representative of the farmers' market movement, of rigorous standards applied to all stallholders and food handlers, equivalent to those applied to food premises.
- 9.70 It was suggested to us by the farmers' representative association that there was a need for clarification of relevant regulations and for enforcement of consistent standards at all farmer's markets throughout the country. **We encouraged this Association in conjunction with the enforcement authorities to ensure consistency of standards and enforcement throughout the country and we commended the action taken by the Scottish Food Advisory Committee to review the operation of farmers markets.**

CATERING ESTABLISHMENTS

- 9.71 We noted the written evidence presented to us on some practical suggestions to reduce *E.coli* O157 in catering establishments.
- 9.72 It was suggested to us by the Scottish Food Co-ordinating Committee (SFCC) that the provisions of the butchers licensing scheme should be extended to all high risk businesses. The Pennington Group did acknowledge that the risks to public health from other high-risk premises, e.g. carry-out premises, bakers, and other catering establishments, may be no less than in butchers premises. Although this went beyond its remit, the Pennington Group could see no reason in principle why licensing arrangements could not be extended to cover other areas. **We therefore recommended that the effectiveness of the implementation of licensing in butchers shops should**

be assessed by the Food Standards Agency prior to considering the extension in all other high risk premises.

- 9.73 We noted a recent study carried out in Sheffield into caterers awareness of *E.coli* O157 and the practices undertaken to prevent the risk of infection. Results demonstrated a lack of understanding of the term “cross-contamination” by some of the caterers.
- 9.74 Existing food hygiene legislation required food businesses to undertake “own checks” based on some of the HACCP principles⁵ (notably hazard analysis). Implementation of the full range of HACCP principles was currently a legal requirement only within the Butchers Licensing Regulations. The Butchers Licensing Regulations also required a minimum level of training for food handlers.
- 9.75 We were therefore encouraged to note that the proposal to have HACCP enshrined within the EU Food Hygiene Directive is currently being progressed within Europe and is expected to become law by 2004. **We encouraged the UK Government to continue to press for adoption of HACCP.**

Recent Developments

- 9.76 Recent developments in the food chain have included treatment processes such as irradiation, steam pasteurisation and the use of ozone.
- 9.77 Both ACMSF and Pennington Group recommended further research on the potential use and benefits of end-process treatments such as steam pasteurisation. Research on steam surface pasteurisation has just recently been completed which demonstrated that up to a 1 log reduction i.e. to 1/10th might be achieved using this process, although further work on the distribution of organisms and carcass to carcass variation still needed to be carried out. Industry will no doubt determine whether this is a cost effective treatment although we were encouraged by any reduction, however small, of numbers of organisms particularly where initial levels are high.
- 9.78 We heard also of research being undertaken by the University of Strathclyde which combined microbiology and electrical engineering. This work in the laboratory suggested a potential possibility of reducing bacterial load on foodstuffs, liquids and surfaces by 6 – 7 log i.e. to 1 millionth or less. Innovation of this kind, if developed, could contribute to improvements in hygiene of premises and product.

GENERAL CONCLUSIONS ON KEY RISK FOODS

- All in the food chain and consumers should understand that the subjects of our study (animals, waste, water supply, access to the countryside, food chain and human health) are interlinked
- Good practice is possible in food businesses of all types and scales of operation
- Training is not only for the day the course takes place; it’s for every day
- Traceability is vital in the event of association with an outbreak or case of infection with *E.coli* O157

⁵HACCP - Hazard Analysis and Critical Control Points

- Information on a product should be sufficient to allow the consumer to distinguish products which may pose a potential risk to susceptible individuals
- There is a need for regular review and issue of key food safety messages to both producer and consumer

SUMMARY OF RECOMMENDATIONS

- **More appropriate and effective to focus *E.coli* O157 monitoring in foods to situations where biological plausibility allowed for targeted, well defined study or where there was suspicion or association with an outbreak**
- **The application of the Meat Products Regulations should be reviewed and clarified**
- **The ACMSF message continue to be reiterated at frequent intervals, not least throughout the ‘BBQ’ season**
- **All raw drinking milk and raw cream for sale for consumption in that state in England and Wales should be heat treated**
- **Raw sheep and goats milk for sale for drinking in England and Wales should be heat treated**
- **The recommendations on traceability in the Report on Small Scale Cheese Production in Scotland are implemented by the FSA**
- **Cheese made from raw milk should be clearly identified at retail level to permit the consumer to make an informed choice**
- **Clear labelling/instructions for ready to cook/eat salad vegetables were required and should be supported by regulations**
- **Growers of salads/vegetables to be eaten raw should be advised on the correct handling of organic wastes**
- **Adequate training be made available and undertaken by all of those involved in the preparation, handling and distribution of salad and vegetable crops**
- **All salad/vegetables to be consumed in their raw state, even though pre-washed, should be washed prior to consumption**
- **An education programme be targeted at smaller businesses, caterers and consumers on the need for a high standard of personal hygiene and for effective washing of all ‘raw’ salad and vegetable products prior to sale and consumption**
- **Correct handling procedures for sprouted seeds were included as part of the above education campaign**
- **The effectiveness of the implementation of licensing in butchers shops should be assessed by the Food Standards Agency prior to considering the extension in all other high risk premises**
- **The UK Government to continue to press for adoption of HACCP**

CHAPTER 10

EDUCATION AND COMMUNICATION

In this Chapter we:

- Consider how education/awareness raising was currently organised
- Discuss the need for information on particular groups, especially children
- Consider how those needs might be met
- Ask what lessons in communication might be learned from the media

INTRODUCTION

- 10.1 In the course of our work we recognised the need for clear and authoritative guidance aimed at a wide range of people who might come into contact with *E.coli* 0157. This was the essential and complex issue of risk communication. This recognition was similar to a key finding of the Pennington Group in relation to the education of farmers, butchers and other food handlers. We also appreciated that the messages from any guidance needed to be pressed home not once but at regular intervals.
- 10.2 The Core Team understood more and more about *E.coli* O157 as we progressed through the business of the Task Force. We were delighted by the collaborative way in which the 150 members of the Task Force members worked together, played a part in bringing life to some esoteric subjects and to some sadly serious subjects too.
- 10.3 Our method of operation was built on the principles of openness and inclusion. Part of our output had to recommend ways of improving the communication of this understanding more widely.
- 10.4 Actually undertaking effective risk communication was a serious challenge and outwith the remit of the task force. It falls to the sponsoring departments to present our recommendations to those who were identified as the best parties to lead and encourage effective and timely guidance to the range of interests we have identified. This chapter would be devoted to consideration of the part that guidance, training, education and communication might play in our action plan.

COMMUNICATION IN A RANGE OF SETTINGS

Pre-school Provision

- 10.5 Nursery schools and other such services for the under-5's featured much in our thinking in relation to giving simple but vital personal hygiene messages. The messages were important to reduce the risk of infection in the first place and to reduce the likelihood of person to person spread when there was an infection. (Chapter 4 paragraphs 4.42 and 4.43). We were also conscious of the need for clear guidance in relation to the risks to children from activities such as educational visits to farms (Chapter 8). An education programme in respect of *E.coli* O157 would need to succeed in communicating the reality that *E.coli* O157, although it strikes relatively rarely can strike with terrible consequences for susceptible people.

- 10.6 The Scottish Executive Education Department (SEED) encouraged us to think more broadly, to include nurseries, family centres, crèches, playgroups and childminder services. There might be difficulty in making contact with some relevant interests, for example, establishments which are not linked into associations or staff who are mobile or operating in a very informal setting.. However a significant start could be made by targeting information on the networks that do exist. These could include bodies providing training or qualifications, local authorities and voluntary organisations. We thought that, within the more formal setting of pre-school education services there would be some existing teaching of personal hygiene upon which our messages could be built.
- 10.7 We thought the greatest need for risk communication was for those responsible for under-5's in large nurseries. In our consideration of "Human Health" interests, we had discussed how realistic it would be to set standards for the management of potential infection in these institutions. The standards might include training staff to observe symptoms such as toilet visits, diarrhoea, or bloody stools and the keeping of records from such observations to indicate potential cases. On the whole, we thought such actions excessive as day to day routines. However the training benefit of undertaking such an exercise on a short term might still be worth trying. Certainly such an intensive approach is reasonable when there may be infection in one of a group of nursery aged children in order to give early warnings of possible spread.
- 10.8 As discussed in Chapter 4, we recognised that children may well be attending nursery etc. despite gastrointestinal symptoms. This would clearly pose a potential risk of person to person spread. Many working parents and carers are under considerable pressure to continue to attend work when their children have what appear to be minor illnesses. **We recommended that in these circumstances the guidance to parents and carers should seek their co-operation in recognising when to keep children at home in order prevent cross infection. The managers of institutions such as nurseries, playgroups etc., should also be given guidance on the risks involved and the actions to take. Power to exclude a child on health risk grounds is noted in Chapter 4.**

School Education

- 10.9 Although the curriculum is not prescribed nationally, there are guidelines for the 5 – 14 years curriculum which highlight the importance of the principles of good hygiene. SEED advised us that updating on health and hygiene arising from our work could be useful to Home Economics teachers, other school staff, to parents and pupils. Given our range of interests, beyond food hygiene alone, **we recommended that our findings regarding risks and actions to minimise risk can be helpfully communicated to children and young people through the health education and environmental aspects of the curriculum.**
- 10.10 We noted that the Chief Medical Officer (CMO) Scotland had given guidance to education authorities on educational visits to farms which advocated the benefit of continuing such activities but with proper regard for safety from potential risks. **We support that approach.**

- 10.11 We have already described the need to explain to farmers, education authorities and teachers how they can self-assess the safety of educational visits to farms (Chapter 8). **We recommended including such information and a generic risk assessment form if possible in the educational programme.**

Further Education/Lifelong Learning

- 10.12 The Task Force saw the possibility of promoting clear messages to students attending relevant vocational courses at Further Education Colleges. We thought courses such as catering, tourism and horticulture would be good places to start. Although there is no direct government intervention in the curriculum of these institutions, SEED would be willing to collaborate in communicating our message through available networks.

The Work Place

- 10.13 We looked at communication in the workplace by a variety of agencies. These included local authorities, the Health Education Board for Scotland (HEBS), The Health and Safety Executive (HSE), the Heather Preen Trust, HUSH, the Scottish Agricultural College and the National farmers Union of Scotland.
- 10.14 The Health and Safety Commission (HSC) had overall responsibility for policy on health and safety at work and advice to Ministers including advice on standards and legislation. HSE was the operational arm of HSC. It advised HSC on health and safety policy and (along with local authorities) enforced health and safety legislation in workplaces throughout Great Britain. HSE was responsible for the provision of advice and guidance and enforcement in a range of industries, including agriculture.
- 10.15 Current advice to employers, workers and the self-employed working in the industry on the risks and precautions associated with *E.coli* O157 was set out in Agriculture Information Sheet No. 2 “Common Zoonoses in agriculture” (revised in November 2000). Dealing with the risks from a range of zoonotic infections, the guidance stressed the importance of good livestock management practice, safe working practices, the provision, where appropriate of personal protective equipment and particularly, high standards of personal hygiene.
- 10.16 Separate, more comprehensive advice and guidance targeted at farmers and others responsible for open farms, or farms which run open days, on practical steps to reduce the risks of ill health to visitors, principally, *E.coli* O157 was contained in Agriculture Information Sheet No. 23 “Avoiding ill health at open farms – Advice to farmers” and included a teachers supplement. These publications, freely available from HSE’s divisional offices and the website clarified the law, primarily the requirements of the Control of Substances Hazardous to Health Regulations 1999 and gave practical guidance on issues such as risk assessment and relevant control measures including farm layout, livestock management arrangements, contact with animals, washing and eating facilities, the provision of information and signage, training and supervision and sources of further advice.
- 10.17 The advice, subject to ongoing review, had been widely promoted through relevant national farming associations and local education authorities, through contacts with

local community/public health initiatives and during routine preventive inspections within the agriculture sector. It had been made available to local authorities and on request to organisations involved in recreational and leisure activities and to the public.

- 10.18 Further work was also planned to develop visual aids targeted particularly at responsible adults/parents/teachers etc., which graphically demonstrate the importance and effectiveness of high standards of personal hygiene.
- 10.19 Local Authorities were involved principally in implementing or enforcing a wide variety of food hygiene and other relevant legislation. In order to do this local authority staff themselves have to be well informed and must remain up to date. They are themselves engaged in formal training, CPD schemes, corporate training and update events. Enforcement is supported by a considerable effort in communication (written and oral) for the benefit of the businesses being visited/inspected. Alongside their direct interest in environmental and food safety matters, Environmental Health Departments will have liaison arrangements with related interests such as farmers' markets, and residential care.
- 10.20 In the Local Authority the approach needed to be at a number of levels
- Maintenance/updating of clear guidance and effective training to the relevant Local Authority staff
 - Effective guidance material to businesses
 - Good enforcement regimes
- 10.21 The health promotion messages undertaken by HEBS were described to us as targeted at a wide range of audiences including the general public, community, health service, schools, voluntary sector and the work place. The aim was to take clear messages to people in a number of settings, acknowledging that people live, learn, seek help from, work and spend leisure time in a number of distinct places.
- 10.22 There was a strong sense of planning in the communication process which HEBS described to us. Where possible they would work through existing structures e.g. local health promotion departments, professional groups, which would feed through to community groups, voluntary sector groups and the work place. Their input would be tailored to the frameworks within which they had to work. Their health promotion the "3 Rs" that the messages had to be **relevant, realistic and rewarding**.

Communicating with farmers and other rural interests

- 10.23 Because of the significant rural dimension to our study we sought views from the Scottish Agricultural College (SAC), which had 3 educational campuses, 7 farms, 8, veterinary centres, 23 local advisory offices and 7000 farmer clients. The College had interest in many areas including agriculture, rural issues and recreation, food science and technology and the environment. Their work involved face to face contact through conferences, farmers meetings and exhibitions at local shows. Written material included routine publications, newsletters, press releases and features in farming journals. Farmers were also now accessing through the College website. To ensure that farmers got benefit from the published information it was necessary to be clear and concise, especially where technical material was involved.

- 10.24 Farmers suggested that contact needed to be made with them, with farm workers, hauliers, auction marts, livestock dealers, abattoir workers, vets, contractors and farm advisors. Likely communication routes might be the farming press, daily papers, TV, radio and press conferences, not to mention the National Farmers Union of Scotland monthly bulletins. Key messages would have to be repeated regularly. HSE and training bodies could assist by advising farmers and students of the risks involved in handling livestock.
- 10.25 As mentioned previously *E.coli* O157 is of recent origin. The farming community, particularly older members may need to be persuaded of the risk that the organism now poses to them or more particularly to children within their families and communities. Immunity within the farming community is neither proved nor disproved, but it is known that as people reach old age they are more susceptible to *E.coli* O157.

From the patient/carer perspective

- 10.26 Julie Preen described to us her response to the death of her daughter by creating a Trust the purpose of which was to make available information and understanding which had been absent time and time again at the time of Heather's death and afterwards.
- 10.27 With commercial sponsorship and close professional help, the Heather Preen Trust produced 2 leaflets, one for parents/carers and one for health professionals. The Trust's priority had been to make the information clear positive, rational and emotional. The message was delivered via the media, journals, the internet and an extensive mailing. Health Visitors and Environmental Health Departments had shown interest and large numbers of leaflets and posters were issued. GPs and pharmacists had not shown much response. However, Heather's checklist was firmly in the public domain.
- 10.28 The Trust judged mailings and the media to be the best channel of communication. It was now reviewing the success of the leaflets.
- 10.29 HUSH provided us with samples of its publicity material and copies of its correspondence with Government Departments. Its efforts to gain recognition of the priority for action demonstrated to us the difficulty potentially faced by single interest groups. However well-informed and lateral-thinking they might be, there could be a risk of their being seen as too narrowly focussed. Where a body fought to influence policy at local or national level, the narrow focus of the body's proposals could be too specific to fit existing structures of regulation or policy. Perceptions of proportionality could be different also, depending upon the breadth of the parties' interests.
- 10.30 We thought it instructive that communication within the Task Force structure felt more constructive because of our inclusive procedure.

ROLE OF THE MEDIA

- 10.31 We were keen to be as realistic as possible in our thinking on communicating our key messages. Although much would be achieved, no doubt, by tried and tested methods described previously, we wanted to think laterally about imaginative engagement with the media. It was impressed upon us at the outset that communication is a massive exercise and one that needs to be specifically targeted. Our messages would cover a number of separate sectors each one to be addressed as diversely as possible.
- 10.32 The recent FSA Public Attitudes Survey had revealed that *E.coli* was not particularly high on the public agenda. The public would therefore have to be re-engaged if communication was to be successful. We thought the media incredibly powerful and challenging; but they would want “a good story”. Whether discussing scientific detail or practical matters the message must be clear. In particular scientists must be able to communicate effectively: Professor Pennington’s success in this area was acknowledged.
- 10.33 Most parts of the Task Force’s range of interests had featured in the media from time to time. Farming, waste, water supply, food – all had been probed at some time for a news-worthy story. Participants’ experience of such investigations was turned around to consider ways in which a very broad education programme proposed in our recommendations could be assisted through media exposure. It was clear that basic science and formal recommendations would not communicate effectively in the way we wished. Even though we had adopted a relatively conversational style for the text of our report, it was impressed upon us that *communication*, in the sense of *understanding*, would require a different kind of vocabulary. It was not so much a matter of the public’s inability to understand but more a matter of officials/experts’ inability to communicate. Participants close to the media urged us to become comfortable with a much more relaxed form of popular language. “Killer bug” communicated where “VTEC” would not. “Cow shit” was more striking than “faecal material”. The media would no doubt find it easier to use the communicative style than would those writing official reports.
- 10.34 Given the open and consultative stance of the Task Force, it did not take great imagination to extend this policy to journalists. Such a move would, however, imply a perceived loss of control. Our participants were clear that the authorities could not seek to direct the way in which press interests handled messages that we wished to broadcast. There would always be a keen desire for a good story. There would always be the challenge to orthodox approaches, always the claim of the media to publish its view of the truth.
- 10.35 When the media become involved, the scale of communications exercise could also become daunting. However, by involving the media and, through them, the public in this way, the Task Force’s messages could be disseminated more effectively than solely by more traditional methods.
- 10.36 Since its first discussions in September 2000, the Task Force had appreciated the movement towards greater openness in communication with the public. The Food Standards Agency, a government department but at arms length from Ministers, had set out in its first year of existence to put its business routinely in the public domain. The

Task Force was similarly established with a degree of independence and had similarly put its business in public through the website. **We recommended, therefore, that implementation of this Report should seek to enlist the support of the media and the public in carrying forward its recommendations.**

SCOPE OF THE TASK FORCE EDUCATION PROGRAMME

10.37 Across the chapters of this report we have recorded recommendations for education or communication activity which might be summarised as follows:-

- Diagnosis - early detection
- therapeutic intervention
- Management in general practice and in general hospitals
- Waste - awareness raising for farmers, contractors, etc.
- Water - PEPFAA Code strengthening
- “keeping it safe” leaflet reissue
- Rural - interim guidance restated
- open farms advice
- Food - education programme on production of vegetables and salads
- advice on burgers
- advice on raw milk
- advice on personal hygiene

RECOMMENDATIONS

- **Engage media and public**
- **Communicate the science effectively, clearly and concisely**
- **Put the message across as diversely as possible**
- **Present information openly and clearly**
- **Be aware of potential for news and stories**
- **Make use of trade journals**
- **Target specific topics, specific sections of the media and specific groups of interested people**
- **Raise the profile of the public’s ability to make a difference through simple procedure and precautions**
- **Seek a cultural change towards personal hygiene**
- **Give guidance to parents and carers which should seek their co-operation in recognising when to keep children at home in order to prevent cross infection. The managers of institutions including nurseries, playgroups etc., should also be given guidance on the risks involved and the actions to take. Power to exclude a child on health risk grounds is noted in Chapter 4.**
- **Communicate our findings regarding risks and actions to minimise risk can be helpfully to children and young people through the health education and environmental aspects of the curriculum.**
- **Including information on risk self-assessment for educational visits to farms, and a generic risk assessment form, if possible, in the educational programme.**
- **Implementation of this Report should seek to enlist the support of the media and the public in carrying forward its recommendation.**

CHAPTER 11

SUMMARY OF RECOMMENDATIONS

CHAPTER 2 - SETTING THE SCENE

- Further research be carried out to identify why the virulent genes which can cause disease in people are not 'switched on' in animals or otherwise do not affect them.
- Continuing research into the epidemiology of individual cases and outbreaks is undertaken
- Communication and education processes within the food chain and within the home to be repeated regularly
- An ongoing drive to alter the public culture by education and improved understanding

CHAPTER 3 – RISK

- That longitudinal studies be undertaken in both cattle and sheep.
- SEHD commission research on ages of responsibility of children
- The need to give priority to relatively simple messages which could make a significant improvement in our protection from risk
- That such messages need to be tailored very carefully to suit the target audiences and generally have to be reiterated at regular intervals
- That advice needs to be set in a picture sufficiently wide to allow the non-specialist to appreciate the way in which factors interact e.g. cattle with camping, holiday cottages with private water supply. The PEPFAA code does this well. Others are needed e.g. education/child care, public health/recreation
- That guidance should interpret the legislation and not lessen its impact

CHAPTER 4 – DIAGNOSIS TREATMENT & CARE - PUBLIC HEALTH MANAGEMENT

Diagnosis

- Where diarrhoea persists for more than 48 hours, a patient should seek advice of a doctor or other health professional
- Where diarrhoea was bloody, a patient should immediately consult the doctor and a GP should immediately be thinking about *E.coli* O157
- The GP should obtain an early sample for submission to a laboratory to confirm or eliminate *E.coli* O157
- NHS Scotland should develop advice which should include guidance on the circumstances in which a patient seeks early medical advice e.g. type and duration of symptoms and in which a GP requests a specimen
- Stool sampling in the high-risk groups or those with the clinical features identified should be submitted
- NHS Scotland should develop a concerted and consistent educational campaign targeting the public, medical, and paramedical services.
 - To increase awareness of the need for early diagnosis
 - To reduce the risk of person to person spread

- To facilitate therapeutic intervention as early as possible
- The need for testing all diarrhoeal samples for *E.coli* O157 and for referring *E.coli* O157 isolates to the National Reference Laboratory (SERL) should be formalised in diagnostic laboratories protocols
- Where the index of suspicion of *E.coli* O157 infection is high and initial testing is negative, further, more sensitive testing should be carried out by the Reference Laboratory
- The IMS Technique should be used where:
 - Any case of HUS or TTP in which conventional culture has failed to yield a pathogen
 - Any case of a bloody diarrhoea stool in which conventional culture has failed to yield a pathogen and more than 4 days have elapsed between the onset of diarrhoea and obtaining a stool sample
 - Any patient of less than 10 years of age or over 60 years of age with diarrhoea from whom conventional cultures has failed to yield a pathogen and more than 4 days have elapsed between the onset of diarrhoea and obtaining a stool sample
 - Any contacts of a case or outbreak-associated case with diarrhoea from whom conventional culture has failed to yield a pathogen
 - Any asymptomatic contacts of a case or outbreak-associated case from whom conventional culture has failed to yield a pathogen and who are in a high risk group, i.e., under 10 years, over 60 years
 - Stool samples should also be examined for the presence of non-O157 VTEC for organisms for which this technique is available
- NHS Scotland should establish a procedure for on going review of conclusions of our report in relation to new knowledge and emerging techniques

Treatment

- Guidance on the use of antibiotics in cases of *E.coli* O157 or potential *E.coli* O157 infection should be reconsidered by NHS Scotland
- Guidance on the use of antimotility agents in *E.coli* O157 or potential *E.coli* O157 cases should be reconsidered by NHS Scotland
- Creation of clinical guidelines on management of *E.coli* O157 and complications through formal networks e.g. Scottish Intercollegiate Guideline Network (SIGN), Clinical Standards Board for Scotland (CSBS), the Scottish Infection Strategy and Standard group and by more specific initiatives
- Creation of education initiatives for health professionals and related interests and for the public on *E.coli* O157 and complications

Care

- Improve communication about illness to sufferers and their families, involving appropriate vocabulary, thoughtful targeting and relevant presentation

Public Health Management

Person to Person Spread

- **Consideration should be given to allow for the exclusion of a child on health risk grounds from nursery schools**
- **Personal hygiene should be promoted generally**
- **The importance of handwashing to the public and the staff of institutions including hospitals, nurseries, playgroups etc., be publicised at regular intervals**
- **Our preliminary work in relation to ages/thresholds of competence in matters of personal hygiene should be taken further, for example by infection control nurses, and information leaflets produced**
- **Use of hygiene facilities should be promoted within high risk groups e.g., children under 10 years of age within schools, nurseries, playgroups etc., visiting open farms or camping on agricultural ground**
- **Hygiene for families/groups affected by *E.coli* O157 infection should be promoted via available literature**
- **All contact siblings under 5 should be excluded as a condition of licensing of nurseries and other education/social work facilities**

Surveillance

- **Introduction of a standardised enteric disease surveillance form**
- **Adoption of a revised Scottish Infectious Disease Surveillance System (SIDSS)**
- **Continuation of the *E.coli* Register**
- **Creation of a surveillance system for HUS to include both children and adults**
- **High priority is given to ensuring that outbreaks are adequately investigated, sources and outcomes traced, reports produced and copies forwarded to Scottish Centre for Infection and Environmental Health (SCIEH)**
- **Integration of surveillance of *E.coli* O157 from human/food/animals and environmental sources, including water**

Outbreak Management

- **The Cairns Smith Group should consider the following:**
 - **Clarify roles and responsibilities especially at national level e.g., Designated Medical Officer, Food Standards Agency, SCIEH, EHOs**
 - **Consider need for a national SWAT team**
 - **Consider creating a panel of national experts for outbreaks and especially food investigation**
 - **Develop protocols for food and epidemiological investigation e.g., sampling priorities, recording, liaison with food laboratories, tracing food chain, inspection required for outbreaks**
 - **Develop and standardise protocols for controlling water-related incidents**
 - **Improved co-ordination and formalised support mechanisms among neighbouring Health Boards/SCIEH/FSA**
 - **Ongoing review and development of local outbreak plans between Local Authorities, Health Boards and FSA**
 - **Consider introduction of standards and audit for outbreak management**

- Consider introducing formal reporting system for outbreaks and encourage formal publication of outbreak reports

CHAPTER 5 – ANIMALS AND THE ENVIRONMENT: UNDERSTANDING THE HAZARD

- Educate the public, and those with relevant occupational interest, on the prevalence of *E.coli* O157 in all ruminants, but mainly in cattle and sheep
- Advise farmers, other animal handlers and their families of the potential risks from contact with animals and their faeces or from cross contamination.
- Carry out more follow up studies back through multiple routes of infection
- Consider detection of other VTECs
- Maintain ongoing surveillance, identify risk factors and reduce spikes of excretion
- SEERAD should institute now, research to monitor the introduction and movement of *E.coli* O157 in some restocked herds post foot and mouth

CHAPTER 6 – ORGANIC WASTE ON LAND

- That an education/awareness programme for the farming community would again be worthwhile together with a commitment to periodic revision and publication
- The PEPFAA code guidance on waste management and recycling should be the subject of a concerted consultation programme by the Scottish Agricultural Pollution Group with farmers, other land managers and contractors as part of the Executive's review of the Code.
- A generic risk assessment format should be part of Farm Waste Management Plans and of the consultation referred to above.
- An education and awareness-raising campaign on waste storage, practical treatment and application should be initiated by the Executive through the Scottish Agricultural Pollution Group for farmers, other land managers and contractors.
- As part of the foregoing campaign, the Executive, with the Scottish Agricultural Pollution Group, should strengthen waste management/recycling practice through incentives for creation and implementation of farm waste management plans.
- Farm/product assurance scheme should be encouraged to adopt PEPFAA guidance, including Farm Waste Management Plans, as prerequisites.
- Steps to minimise volumes and leakage of contaminated water should be encouraged by the Scottish Agricultural Pollution Group
- More Quality Control and Quality Assurance should be established for exempt industrial wastes brought in off-farm and also for irrigation (see also 'Sewage
- Store blood at 15°C or below (if not practicable, consideration should be given to more frequent removal from the abattoir i.e. daily)
- The Scottish Executive consider exempting the spreading of industrial waste conditional upon
 - The contractor satisfying SEPA of its satisfactory pre-spreading assessment for the site
 - SEPA being satisfied through site inspection that the spreading carried out under exemption did not cause environmental pollution. This topic should be included also in the initiatives for education and good practice recommended at paragraph 6.34.

CHAPTER 7 – WATER SUPPLY

Public Supplies

- The water authority gives particular attention to coliform and *E.coli* testing of water from a high risk catchment area. Where coliforms or *E.coli* were detected repeatedly in a supply, routine testing for *E.coli* O157 should be considered.
- Where a supply has had repeated coliform and *E.coli* failures and/or known treatment works failures immediate testing for *E.coli* O157 should be carried out and boil water notices issued as appropriate

Private Supplies

- The PEPFAA Code should also include a requirement for fencing off water sources e.g. springs, wells and boreholes and
- That the Scottish Executive should consider means of making this a mandatory requirement for private water supplies.
- The leaflet ‘Keeping it Safe’ is revised and re-issued to all owners and users of private water supplies as soon as it is practicable
- Unless water is known to be of good quality then advice on boiling the water should be provided to all visitors etc.
- Where high levels of coliforms and *E.coli* are detected within a private water supply whether to a single dwelling or to e.g. a campsite, boil water notices should be issued until steps have been taken to improve the quality of the water.
- A standardised boil water notice be used by both Local Authorities and Water Authorities to ensure a consistent approach is taken throughout the country in the event of the detection of *E.coli* O157 in both private and public water supplies.
- Testing for *E.coli* O157 be carried out if an association with either a private or public water supply is identified during the course of an outbreak or sporadic case of *E.coli* O157 and in addition boil water notices are issued to all persons/properties on the supply. We judged it important that where testing for *E.coli* O157 is to be carried out in association with human illness, samples be sent to a laboratory with facilities to test by IMS, e.g., SERL.
- The Scottish Executive should consider measures to ensure unsatisfactory private water supplies are upgraded to an acceptable standard.
- Microbiological risk assessment should be included as a regulatory requirement.

CHAPTER 8 – ACCESS AND USE OF RURAL LAND

- Reiteration of advice to farmers at regular intervals
- Greater care by workers in keeping working clothes, vehicles and working animals separate from children and domestic space
- Work should be commissioned by SEHD to review infections among animal handlers
- Place greater onus on owners or managers of private water supplies to ensure that a risk assessment is updated at regular intervals
- Those planning camping, etc. should check out the water supply as far as possible and consider a back up (bottled supply). In relation to burns and streams, be aware that

- Surface water run off from fields containing animal droppings can lead to contamination of streams, burns, etc. particularly during wet conditions
- Ensure that water from burns and streams is treated before drinking
- In relation to use of public areas such as show grounds, complimentary action can minimise the risk from animals
 - Remove obvious droppings after the event
 - Cut the grass and dispose of it e.g. fenced off for composting
- Visits to open farms continue to be potentially valuable educational opportunity which should not be discouraged
- In relation to open farm visits, the operators' risk assessment has to be sound and its management of facilities and of visitors needs to be strict
- That publicity on bathing waters and beaches available by the Government, Water Authorities, Local Authorities and Keep Scotland Beautiful should include concerns for
 - Vigilance by bathers in avoiding visible animal droppings
 - Consideration by animal owners in not adding to such pollution
 - Close attention by bathers to personal hygiene, especially in children
- That publicity on bathing waters and beaches available by the Government, Water Authorities, Local Authorities and Keep Scotland Beautiful should include concerns for
 - Vigilance by bathers in avoiding visible animal droppings
 - Consideration by animal owners in not adding to such pollution
 - Close attention by bathers to personal hygiene, especially in children
- The HSE guidance on levels of supervision should be the minimum level required and in addition
 - Where direct contact with farm animals is possible, children under 5 years of age are at greater risk and may need to be carried or more closely supervised
 - Organised visits to farms or similar sites should first have a pre-visit by the organiser to assess the facilities and gauge where/if close supervision or restriction might be required
 - Where numbers of children were to visit and close supervision could not be arranged, the participation of under-5s should be postponed to a separate, smaller scale visit

CHAPTER 9 – FOOD

- More appropriate and effective to focus *E.coli* O157 monitoring in foods to situations where biological plausibility allowed for targeted, well-defined study or where there was suspicion or association with an outbreak
- The application of the Meat Products Regulations should be reviewed and clarified
- The ACMSF message continue to be reiterated at frequent intervals, not least throughout the 'BBQ' season
- All raw drinking milk and raw cream for sale for consumption in that state in England and Wales should be heat treated
- Raw sheep and goats milk for sale for drinking in England and Wales should be heat treated
- The recommendations on traceability in the Report on Small Scale Cheese Production in Scotland are implemented by the FSA

- Cheese made from raw milk should be clearly identified at retail level to permit the consumer to make an informed choice
- Clear labelling/instructions for ready to cook/eat salad vegetables were required and should be supported by regulations
- Growers of salads/vegetables to be eaten raw should be advised on the correct handling of organic wastes
- Adequate training be made available and undertaken by all of those involved in the preparation, handling and distribution of salad and vegetable crops
- All salad/vegetables to be consumed in their raw state, even though pre-washed, should be washed prior to consumption
- An education programme be targeted at smaller businesses, caterers and consumers on the need for a high standard of personal hygiene and for effective washing of all 'raw' salad and vegetable products prior to sale and consumption
- Correct handling procedures for sprouted seeds were included as part of the above education campaign
- The effectiveness of the implementation of licensing in butchers shops should be assessed by the Food Standards Agency prior to considering the extension in all other high risk premises
- The UK Government to continue to press for adoption of HACCP

CHAPTER 10 – EDUCATION AND COMMUNICATION

- Engage media and public
- Communicate the science effectively, clearly and concisely
- Put the message across as diversely as possible
- Present information openly and clearly
- Be aware of potential for news and stories
- Make use of trade journals
- Target specific topics, specific sections of the media and specific groups of interested people
- Raise the profile of the public's ability to make a difference through simple procedure and precautions
- Seek a cultural change towards personal hygiene
- Give guidance to parents and carers which should seek their co-operation in recognising when to keep children at home in order to prevent cross infection. The managers of institutions including nurseries, playgroups etc., should also be given guidance on the risks involved and the actions to take. Power to exclude a child on health risk grounds is noted in Chapter 4.
- Communicate our findings regarding risks and actions to minimise risk can be helpfully to children and young people through the health education and environmental aspects of the curriculum.
- Including information on risk self-assessment for educational visits to farms, and a generic risk assessment form, if possible, in the educational programme.
- Implementation of this Report should seek to enlist the support of the media and the public in carrying forward its recommendation

CORE TEAM MEMBERS

Chairman

Professor Bill Reilly Scottish Centre for Infection and Environmental Health

Core Participants

Professor Hugh Pennington (Microbiology) University of Aberdeen

Mr Barti Syngé (Veterinary) SAC Veterinary Science Division

Dr Catherine Benton (Water Supply) West of Scotland Water

Mr Martyn Evans (Consumer) Scottish Consumer Council

Mr Jim Dixon (Environmental Health) Perth & Kinross Council

Dr Ken Oates (Public Health) Highland Health Board

Mr Rog Wood (Animal, agriculture, land uses) Farmer

Dr Sarah J O'Brien (Surveillance – Food Standards Agency)
Public Health Laboratory Service

Departmental Sponsors

Dr Martin Donaghy Scottish Executive Health Department

Mr Jim Thomson Food Standards Agency Scotland

FSA / SE JOINT TASK FORCE ON *E. COLI* O157 MEMBERSHIP AND CONSULTATION PROCESS

Structure of task force

- Chairman appointed by Minister
- Core participants appointed by the Minister for working and assessing delivery options
- Sector participants invited to contribute in their fields
- Secretariat to co-ordinate working arrangements

Working practices

- Commence from evidence published at the *E.coli* O157 open forum on 28 June 2000
- Invite participants (and wider consultees on paper) to provide relevant supplementary evidence
- Submitted evidence to be suitable for putting on FSA web site
- Feedback to be offered on request on contributions made
- Opening meeting for all participants in late September
- Sector meeting on human health (October), land use (agriculture / animal) (November), land use (other interests) (November) and food chain / water (December). Later meetings on, eg risk assessment and communication
- Concluding meeting for all prior to final report
- Expect sector people will attend their respective day (to minimise overlap and duplication) but they are welcome other sector days, if necessary
- Individual / focus meetings on offer, if needed
- Use of web site and exchanges on paper, by e-mail or electronic conferencing on offer to reduce attendance commitment

Opportunities

- Aim for practical action points
- Show FSA / SE forward thinking, taking this complex, multi-faceted issue into new areas, led by new information
- FSA sponsor the bigger picture, beyond food
- Practise joined-up government FSA, SE and Whitehall
- Offer an open, inclusive process
- Distinguish needs for advice and education to public and others

Sensitivities / barriers

- Understand residual / ongoing concerns of patient support groups
- Undesirability of 'second tier' consultee group, hence 'sector' approach
- Tension between core group working and wider interests: create and maintain a balance
- Interests of many to be involved and kept informed; but meetings not to be too large
- Potential consequences for policy, legislation, advice and resources.

LIST OF BODIES CONSULTED BY TASK FORCE ON *E.COLI* O157

Aberdeen Royal Infirmary
Advisory Committee on the Microbiological Safety of Food
Birmingham Children's Hospital
British Deer Farmers Association
British Goat Society
British Retail Consortium
British Veterinary Association (Scotland)
Carrex International
Common Services Agency
Consultants in Public Health Medicine
Department of Environment, Food and Rural Affairs (London)
Department of Health (London)
Department of Health, Social Services and Public Safety (Northern Ireland)
Drinking Water Inspectorate, DETR
East of Scotland Water
Ecos Limited
Edinburgh Royal Hospital for Sick Children
European Food Standards Inspection Service
Edinburgh Royal Infirmary
Farmers Markets
Food Standards Agency
Forth Valley Health Board
FRS Marine Laboratory, Aberdeen
Glasgow District Council
Guide Association Scotland
Handmade Cheese of Scotland
Health and Safety Executive
Health Education Board for Scotland
Haemolytic Uraemic Syndrome Help
Highland Spring
Hygiene Audit Systems
Kerrier District Council, Cornwall
Lanarkshire Area Infectious Diseases Unit, Monklands Hospital

McDonald's Restaurants Ltd
Ministry of Agriculture Fisheries & Food
Meat and Livestock Commission
Meat Hygiene Service
National Farmers Union of Scotland
National Reference Laboratory for E.coli O157, Edinburgh
North of Scotland Water
North West Water, England
Public Health Laboratory Service
Quality Meat Scotland
Rowett Research Institute
Royal Aberdeen Children's Hospital
Royal Environmental Health Institute for Scotland
Royal Highland Education Trust
Royal Hospital for Sick Children, Yorkhill, Glasgow
Sainsbury's Supermarket Limited
Scotia Produce Limited
Scottish Agricultural College
Scottish Association of Meat Wholesalers
Scottish Centre for Infection and Environmental Health
Scottish Crop Research Institute
Scottish Dairy Association
Scottish Environment Protection Agency
Scottish Executive
Scottish Federation of Meat Traders Association
Scottish Food Co-ordinating Committee
Scottish Landowners Federation
Scottish Natural Heritage
Scottish Organic Producers Association
Scottish Retail Consortium
Scottish Wholesale Association
Scottish Executive
The Scout Association Scottish Council
Snowie
Specialist Cheesemakers Association

Terra Ecco Systems

The Chamberlain Partnership

The Heather Preen Trust

University of Aberdeen

University of Strathclyde

Veterinary Laboratory Agency

Veterinary Public Health Unit

Wishaw Health Centre

In the course of the work there has been contact with other individuals and those who have taken an active part in the meetings of the Task Force, are named in the Notes of the Meetings.

SAFE SLUDGE MATRIX

CROP GROUP	UNTREATED SLUDGES	CONVENTIONALLY TREATED SLUDGES	ENHANCED TREATED SLUDGES
FRUIT	X	X	} 10 month harvest interval applies
SALADS	X	X (30 month harvest interval applies)	
VEGETABLES	X	X (12 month harvest interval applies)	
HORTICULTURE	X	X	
COMBINABLE AND ANIMAL FEED CROPS	X		
GRASS & FORAGE	X	X (Deep injected or ploughed only)	} 3 weeks no grazing & harvest interval applies
HARVESTED	X	(No grazing in season of application)	

NOTE: All applications must comply with the Sludge (Use in Agriculture) Regulations and DETR Code of Practice for Agricultural Use of Sewage Sludge (to be revised during 2001)

X Applications not allowed (except where stated conditions apply)

OUTBREAK CONTROL TEAM REPORT ON THE OUTBREAK OF *E. COLI* O157 AT NEW DEER MILLENUM SCOUT CAMP, MAY/JUNE 2000

Summary

In May 2000 a Scout Camp was held at New Deer Agricultural Showground in Aberdeenshire as part of the Millennium celebrations. The camp was attended by 337 people. This included 233 cubs, scouts and venture scouts plus 104 leaders and other helpers. The camp was abandoned early because of the atrocious weather conditions. 20 attendees were later confirmed as having *E.coli* O157 with dates of onset suggestive of a point source outbreak. In addition another 50 reported gastrointestinal symptoms.

On 4th June an outbreak control team was convened to control and investigate the outbreak. A descriptive and analytical epidemiological investigation was undertaken. Extensive microbiological and environmental sampling was carried out which included samples of sheep faeces, lying water, food, drinking water, mud, soil and debris from climbing equipment.

E.coli O157 was isolated from the sheep faeces, lying water, soil, Wellington boots and debris from the climbing frame. The animal, environmental and human isolates of *E.coli* O157 were indistinguishable on pulse-field gel electrophoresis.

The weather conditions during the camp were very poor with heavy rain. The camp was held on ground previously used for grazing sheep and it was reported that it was heavily contaminated by sheep faeces. The heavy rainfall caused localised flooding and very muddy conditions. It was postulated that the likely route of transmission for *E.coli* O157 was via hands contaminated with mud before eating food or direct from hands to mouth. Although hand-washing facilities were available many of the camp attendees did not wash their hands. The analytical epidemiological investigation showed that the camp attendees who did not use cutlery or washed their hands were 7-9 times more likely to be ill with *E.coli* O157 than those who did. Climbing the tower and eating at the barbecue also increased their chances of becoming unwell. This supports the hypothesis that environmental contamination of hands or food was the most likely route of infection and suggests that there is a protective effect from washing hands and using cutlery to minimise the risk of environmental contamination of hands or food.

Microbiological, environmental and epidemiological investigations confirmed that the environment was the most likely source of infection.

As a result of this outbreak the Scout Association and Aberdeenshire Council have prepared interim guidance on "Avoiding ill health at camp" to supplement the Scout Association's existing guidance on "Scout Camping" and "Food Safety -The Preparation and Storage of Food"

Recommendations

1. Revised guidance on appropriate selection, preparation and management of sites should be available to organisations proposing to hold any type of activity (e.g. camping, caravanning, agricultural shows, fairs etc) on land normally used for the grazing of animals.
2. Guidance on appropriate selection, preparation and management of sites should be available to organisations proposing to hold any type of activity involving agricultural animals on public land not normally used for agricultural purposes e.g. agricultural shows on public land.
3. Further research is required to investigate the animal reservoir and carriage of *E.coli* O157 and survival of the organism in the environment.

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The Royal Highland Education Trust

GENERIC RISK ASSESSMENT

Farm Name : _____

HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
SILAGE PIT	Falling into pit when empty	No go area	2	4	8	Area needs to be roped off when not full
TYRES ON SILAGE PIT	Falling into tyres – may be full of water etc	No go area	2	3`	6	Supervision
FALL FROM HEIGHTS	Into trailer park Loading bay	Near to, but not on route	3	3	9	Supervision
OBJECTS FALLING FROM HEIGHTS	Branches etc in winds Pallets Sawdust bags Hay bales	Avoid wooded areas in severe winds Pallets, sawdust bags and hay bales kept to a height of 1.5m	1	4	4	Supervision
ROOTS/ STUMPS FROM TREES	Sprains and breaks	Qualified first aid staff	1	3	3	Supervision
SLIPS, TRIPS & FALLS Sprains and breaks		Qualified first aid staff	3	2	6	Supervision



FARM RISK ASSESSMENT CONT.

HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
DYKES	Sprains, breaks, cuts, bruises and loose stones falling on people	Qualified first aid staff Dykes on route kept in good repair	1	3	3	Supervision
UNSAFE GATES	People falling from gates, or gates falling on people	Gates on route checked prior to a school visit	2	2	4	Supervision
FARM DOGS	Jumping up, over friendly, Possibly risk of biting	Dogs on a lead and chain	3	2	6	Supervision
SUCKLERS & CALVES	Danger of being attacked by cow protecting calf	Not on route	1	5	5	Supervision to make sure visitors do not leave route
BULLS	Danger of being attacked by loose bull – or panic by children generating panic in bull	In secure bull pen. No go area	1	5	5	Supervision to make sure visitors do not leave route
ANIMALS	Zoonoses (diseases transmitted from animals to humans)	Wash hands immediately after touching animals and before consumption of food and drink. Continuous disease recording and continued supervision under the terms of the Herd Health Plan	1	5	5	Supervision and signs enforcing that animals should not be touched unless otherwise advised.
HENS (DOMESTIC PETS)	Salmonella	Wash hands and boots	1	4	4	Supervision and awareness of risk of touching droppings



FARM RISK ASSESSMENT CONT.

HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
RAW MILK	Salmonella Listeria	Consumption of raw milk is not permitted Hands and feet washed immediately after visit	1	4	4	
RATS	Weils Disease	Poison	1	5	5	
SHEEP AT LAMBING	Enzootic abortion or toxoplasmosis for pregnant women	No pregnant women allowed in shed at lambing.	1	4	4	
CONTACT WITH NEWBORNS	Enzootic abortion, toxoplasmosis, cryptosporidium, campylobacter	A petting area set to one side with hand washing facilities available	1	4	4	
CONTACT WITH VEHICLES/ MACHINERY/ EQUIPMENT	Trapped by machinery if allowed to move.	Designated no go areas. Keys removed	1	5	5	Supervision
SLURRY TANK AND HOSE	Falling in and/or tripping over hose on ground	Lift ladder and hose out of reach. No go areas	1	5	5	
CONTACT WITH GATES COVERED WITH FAECES	Manure contamination	Wash hands and boots	2	4	8	Supervision
ILLNESS FROM DIRTY HANDS AFTER TOUCHING PLANTS AND SOIL	Manure contamination if there has been recent animal access	Wear blue gloves Wash hands and boots	2	4	8	Supervision Only take samples of plants or soils from fields where there has been no recent animal access



FARM RISK ASSESSMENT CONT.

HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
WALKING THROUGH FAECES OR ANY BUILD UP	Manure contamination	Wear blue gloves Wash hands and boots	4	4	16	Supervise boot wash
WALKING THROUGH SILEAGE EFFLUENT	Manure contamination	Wear blue gloves Wash hands and boots	4	4	16	Supervise boot wash
DUST	Asthma	Qualified first aid staff	3	3	9	
SILAGING AND HARVESTING-POLLEN	Hay fever	Qualified first aid staff	3	3	9	
PUBLIC ROAD THROUGH FARM	Being run over	Qualified first aid staff Signs warning of traffic	1	5	5	Supervision
PETROL PUMP	Petrol spillage leading to fire or risk of swallowing	Pump is locked and not on the route	1	4	4	Supervision to make sure visitors do not leave route
ANIMAL FEED – LOOSE	A child could eat it Disease	Wash hands after contact Supervision	1	3	3	Supervision
COMPRESSOR IN DAIRY BULK TANK ROOM	Hands or fingers caught in moving parts	In locked store cupboard	1	4	4	
DAIRY – MILKING PARLOUR PIT	Falling into pit down stairs or from sides Contact from urine and manure	All visitor wear rubber Wellingtons and stand well back from cows	3	3	9	Supervision
STAINLESS STEEL FLOOR IN DAIRY	Slippy floor if wearing trainers	All visitors advised to wear wellies	2	3	6	Supervision



FARM RISK ASSESSMENT CONT.

HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
TELEGRAPH POLES ETC, BEHIND NEW SHED	Could trip over them or could roll on to someone	Not on route	2	3	6	Supervision to make sure visitors do not leave route
CUBICLES PROPPED AGAINST WALL	Could fall on someone	None	2	3	6	Tie together and secure to wall
DUNG HEAP	Could fall into it leading to manure contamination	No go area. Wash hands and boots	2	4	8	Supervision
FERTILIZER BAGS ON TRAILERS/POTATO BOXES AND PALLETS STACKED	Could fall on someone	Near to, but not on route	2	3	6	Supervision to make sure visitors do not leave route
HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
LOADER BUCKETS	Could trip over them	Near to, but not on route	2	2	4	Supervision to make sure visitors do not leave route
GAS CYLINDERS	Explosion	None	1	5	5	Supervision
'INTENSIVE CARE' FIELD/LOOSE BOXES/PENS	Disease could be passed on to visitors	Check animals prior to school visit for any disease which could be passed on	1	3	3	Supervision – no contact allowed with animals in that field
CATTLE GRIDS	Sprain or break falling through cattle grid		2	3	6	Open gate next to cattle grid to avoid walking over it
UNSAFE BUILDING OR CONSTRUCTION	Risk of falling slates/stones	No go area	2	4	4	Supervision to make sure visitors do not leave route
ENTRANCE FROM	Could trip/fall over		2	2	4	Make sure lights are



CALF SHED INTO SAWDUST STORE BADLY LIT						switched on prior to setting off with the group
CHEMICALS	Poisoning; eye damage or skin irritation	Kept out of reach in locked store cupboard	1	4	4	

MOVEABLE HAZARDS

HAZARD & AREA	RISK	EXISTING CONTROLS	LIKELIHOOD (NUMBER)	SEVERITY (NUMBER)	L X S = RISK	ACTION TO TAKE
TRACTOR SCRAPER IN SAWDUST STORE	Manure contamination Could trip over it	Move away from route prior to school visit	1	4	4	
FORK IN SHED USED TO FORK SILAGE	Could trip over or step on it	Move out of reach prior to school visit	2	3	6	
SHOVEL PROPPED UP AGAINST SHEEP PENS	Could trip or fall over them	Move out of reach prior to school visit	2	2	4	
MOWER AND OTHER MACHINERY/COMBINE ETC	Could trip or fall over them or become trapped	Move away from route prior to school visit	1	5	5	
ELECTRICAL APPLIANCES	Electric shock	Move out of reach prior to school visit	2	5	4	Supervision



THE ROYAL HIGHLAND EDUCATION TRUST
RISK ASSESSMENT
RISK ASSESSMENT PROCESS

Farm Name _____

Date

RISK = LIKELIHOOD X SEVERITY

LIKELIHOOD OF OCCURENCE

- 1 Highly unlikely to occur
- 2 May occur but very rarely
- 3 Does occur but very rarely
- 4 Occurs from time to time
- 5 Likely to occur often

SEVERITY OF OUTCOME

- 1 Slight inconvenience
- 2 Minor injury requiring first aid
- 3 Medical attention required
- 4 Major injury leading to hospitalisation
- 5 Fatality or serious injury leading to disability

_____ is a working farm and the hazards and risks change on a daily basis. We therefore undertake responsibility to assess the hazards and risks on the route five days prior to each school visit with a follow up check on the afternoon before each visit.

Teachers Signature

Farmers signature.....



JOINT FOOD STANDARDS AGENCY / SCOTTISH EXECUTIVE
TASK FORCE ON *E. COLI* O157

**INTERIM GUIDANCE ON
RECREATIONAL USE OF ANIMAL PASTURE**

INTRODUCTION

The Task Force is part way through its study of risks from *E.coli* O157. Having received and considered much evidence on environmental sources of the organism, the Task Force has identified some key issues to be addressed in a way that is fair and proportionate to the circumstances.

Prior to the forthcoming “outdoor season” the Task Force is concerned to advise those planning recreational use of animal pasture – fields used for grazing animals - of the potential risks to some people from the organism *E.coli* O157. Those walking and cycling etc., on pasture land face least risk. Adults playing sport or camping get closer to sources of infection, but are less commonly affected. Children are especially at risk. The following guidance is addressed in particular to organisations that arrange camping or picnicking for children, and farmers and landowners who permit animal pasture to be used for such purposes.

BACKGROUND

- Research shows that almost a quarter of cattle herds in Scotland and many sheep and goats carry and excrete *E.coli* O157.
- The animals do not become ill but can spread the organism to people by direct contact and indirectly via droppings and manure spread on land.
- The farmer or landowner will not be aware of animals excreting *E.coli* O157 because the animals show no symptoms and there is no way of knowing when animals are infected.
- Animal droppings on pasture are the greatest worry, especially where there are concentrations of animals in a given area, and in wet conditions. You will find it almost impossible to avoid getting animal droppings on your boots or shoes in these circumstances. Such footwear can spread droppings so easily into buildings, tents, and vehicles. On land affected in this way, fences, gates, stiles, seating and play areas can also become contaminated with animal droppings. **The danger is that these droppings may contain *E.coli* O157.**
- **To be a risk, the *E.coli* O157 has to be swallowed from contact with hands, contaminated food or contaminated water. Even tiny amounts of *E.coli* O157 can be a severe risk.**

- **When conditions are wet, contamination can spread more easily onto hands, footwear, tents etc., with the increased possibility that the organism can pass into the mouth or contaminate food and water.**
- Normally such contact with *E.coli* O157 will be unlikely for most of the population, even those walking and cycling in the country. Those camping, picnicking and playing on farm land used for grazing animals are most at risk. In dry conditions, the risk should be less.
- Surface water run-off from fields containing animal dropping can lead to contamination of streams, burns, etc., particularly during wet conditions
- You may well be able to see the droppings: you will not see the contamination that they cause.
- The organism is known to survive in soil and animal droppings for weeks, but the levels generally decline over time.

RECOMMENDATIONS

- **Ideally, to completely avoid risk of infection by *E.coli* O157 from this source, fields used for grazing or stockholding of animals should not be used for camping, picnicking, and play areas, especially where these involve children.**
- However, as with everyday life, these risks can be greatly reduced by adopting the following sensible precautions:

- Keep farm animals off the fields for the preceding 3 weeks prior to use
- Keep farm animals off fields during use.
- Remove any visible droppings, ideally at the beginning of the 3 week period.
- Mow the grass, keep it short and remove the clippings before the fields are used for recreation.
- Always wash hands before eating, drinking and smoking i.e., use soap, clean towels and, preferably, hot and running water.
- Ensure that water from burns and streams is treated before drinking.
- Ensure adequate supervision of children, particularly those under 5 years of age.

These precautions, taken together, will greatly reduce the risk of *E.coli* O157 and other infections from this source, and allow your camping or sports to continue in greater safety.

TASK FORCE ON E COLI O157

REVIEW OF IMPLEMENTATION OF PREVIOUS VTEC RELATED RECOMMENDATIONS IN SCOTLAND

STATUS: **A** **Recommendations not accepted by Government**
 B **Recommendations accepted but not acted upon**
 C **Recommendations accepted and implemented**

Human Health

Recommendation	Status	Note
<u>Diagnosis</u>		
Advisory Committee on the Microbiological Safety of Food (ACMSF)		
1. We recommend that the Government should consider funding research in the following areas:		UK Departments 'Funded Research'
i characterisation of the adhesins of VTEC strains, including the minority that do not produce the characteristic (attaching and effacing) lesions;	C	3 studies commissioned – on-going
ii <i>in vitro</i> methods for demonstration and detection of pathogenicity determinants to aid laboratory diagnosis; and	C	3 toxin production projects funded 10 projects on pathogenicity including (v)
iii the relationship between VTEC diversity in VT and adhesin production and clinical disease.	C	
2. We recommend that all clinical laboratories routinely examine all diarrhoeal stool specimens for <i>Escherichia coli</i> O157.	C (partial)	1999 Survey : 9% of Scottish laboratories not testing VTEC routinely; 24% unsure of testing
3. We recommend that the Government funds research into the following areas:		
i the development and evaluation of different solid media for O157 VTEC;	C	2 projects funded
ii rapid methods to detect VTEC of all serogroups and Verocytotoxin in food and clinical material;	C	5 studies commissioned including evaluation of current situation being undertaken – noted need for more work
iii the development of methods for improved sub-typing of VTEC and particularly O157 VTEC.	C	2 projects commissioned – on-going

4.	We recommend that the Government continues to support reference laboratory facilities for O157 VTEC and non-O157 VTEC, in order to maximise epidemiological information.	C	Continuing support. New contract placed
5.	Pennington Report (PR) Laboratory testing of stool specimens implementation and monitoring of ACMSF and Group recommendations.	C (partial)	See ACMSF
6.	Further <i>E.coli</i> research proposals to be subject to normal funding considerations with weight given to public health threat of organism.	C	CSO call and funding for projects
7.	Typing of <i>E.coli</i> strain (WL sub-clone).	C	Completed for Central Scotland related court cases 1998
8.	Fatal Accident Inquiry Central Scotland Outbreak (FAI) Doctors to take samples when patient presents with bloody diarrhoea.	C (partial)	Local guidance as required
<u>Surveillance</u>			
9.	ACMSF We recommend that the Government ensures that relevant clinical groups set up national prospective surveillance studies of HC, HUS and TTP in all age groups.	C (partial)	HUS but future under consideration HC/TTP no Scottish group established to consider further development
10.	PR Agree case definition and protocol for testing and defining <i>E.coli</i> O157 cases.	C	SCIEH case definition completed
11.	Surveillance, data collection and analysis improvements plus review of mechanisms for reporting food poisoning.	C (partial)	Development of common dataset Public Health Legislation Group recommends notifiable pathogens
12.	Electronic reporting and analysis of data.	C (partial)	ECOs system piloted: "roll out" plan being developed
13.	FAI It is suggested that perhaps we need to know what incidence of <i>E.coli</i> O157 is in the population at any one time and how great and how small is the risk of a serious infection developing.	C	Major Intestinal Infections Disease survey completed and reported.

<p><u>Treatment and Care</u></p>		<p>Analysis of Central Scotland Outbreak data completed</p>
<p>14. ACMSF</p> <p>We recommend that the Government should consider funding research in the following areas:</p> <p>factors affecting the outcome of VTEC diarrhoeal illness, including the role of protective factors (age, sex, blood group) in progression to HUS;</p> <p>effectiveness of clinical intervention in treating cases of VTEC infection and HUS; in particular, more needs to be known about the efficacy of antibiotics in affecting carriage, spread of infection and outcome of infection.</p>	<p>C</p> <p>C (partial)</p>	<p>Analysis of Wishaw clinic patients in Central Scotland Outbreak completed</p> <p>Follow up of cohort of Lanarkshire Central Scotland Outbreak hospital patients</p> <p>Analysis of outcome of Plasmapharus in patients in Central Scotland Outbreak</p> <p>International research into antibiotics</p>
<p>15. PR</p> <p>Study of clinical information from outbreak</p>	<p>C</p>	<p>As above</p>
<p><u>Outbreak Management</u></p>		
<p>16. ACMSF</p> <p>We recommend that all those involved in managing outbreaks make use of the available guidance on the public health measures to control VTEC infection.</p>	<p>C</p>	<p>Revision of Guidelines following Central Scotland Outbreak completed</p> <p>Further revision planned</p>
<p>17. We recommend that the Government, in association with PHLS and Health Authorities, ensures that during outbreaks, case-control studies are undertaken to provide up-to-date knowledge about sources, routes of transmission, risk factors, and socio-economic costs associated with VTEC infection in the UK.</p>	<p>C (partial)</p>	<p>Only 2 of 29 VTEC outbreaks in period 1996-99 with completed analytical epidemiological investigation</p>
<p>18. PR</p> <p>CPHMs to provide SCIEH with set data for all outbreaks of infectious intestinal diseases.</p>	<p>C (partial)</p>	<p>25 of 29 VTEC outbreaks in period 1996-99 completed dataset</p>
<p>19. Written reports, possibly published, for large outbreaks.</p>	<p>C</p>	<p>Written reports received on all with cases greater than 20 except New Deer (awaited)</p>

20.	Report Central Scotland Outbreak to be published.	C	Published 1999
21.	Health Boards/local authorities to ensure DMO's time to contribute adequately, annual report to Health Board and local authorities.	C (partial)	Public Health Function Review completed; COSLA input into implementation
22.	Local authorities/Health Boards to ensure adequate resources.	C (partial)	Public Health Function Review identified Health Board staffing level; some Boards have not achieved. No standard for local authorities
23.	Review of local authority Local Outbreak Management Plans and authority of Outbreak Control Teams.	C	NHS MEL led to preparation of Outbreak Plans 1997
24.	Review of SO Guidelines on Investigation and Control.	C	Completed 1999
25.	Review internal SO organisation for dealing with outbreaks.	C	Completed 1999 but now for revision with FSA established
26.	FAI As soon as there is reasonable suspicion that food premises are involved in a serious outbreak, the utmost priority should be given to the recall of unconsumed produce. Also it is believed that every step should be taken to alert domestic customers as well as trade when an outbreak occurs.	C	Code of Practice 16 of Food Safety Act revised
27.	Specific mention is made of the Scottish Office revision of the "Guidance on the Investigation and Control of Outbreaks of Foodborne Disease in Scotland".	C	Completed 1998
28.	It is recommended the OCTs should be small and of appropriate composition and they should produce accurate, timely minutes, to include action points.	C	Considered in revised Guidelines
29.	It is suggested that a control team of 2/3 people could be formed to be despatched on behalf of Government to COSLA in the event of serious outbreaks and be given powers to close premises and cross-boundaries.	A	Considered by Revision of Guidelines Group – not appropriate due to importance of local knowledge in managing outbreak and need for clear public accountability. Also considered and rejected by FSA (UK)
30.	If the above is not agreed, then it is recommended that Guidance should make clear the respective functions of public health and environmental health departments.	C	Guidelines revised accordingly
31.	The OCT has a Chairman with the necessary powers to control the outbreak and overrule other disciplines if necessary.	B	To feature in forthcoming Public Health Legislation

<p>32. Recommendations are made regarding media relations; information desk for relatives; dealing with contaminated clothing; taking of stool and blood samples; GP advice to relatives on fluid balance; prevention of secondary infection in hospitals.</p>	C (partial)	<p>Local action</p> <p>No centrally co-ordinated advice</p>
<p><u>Person to Person Spread</u></p>		
<p>33. No recommendations in ACMSF and Pennington Report</p>		
<p>33. FAI</p> <p>Infection control in hospital</p>	B	<p>No specific VTEC advice but general guidance issued and circular on Hospital Acquired Infection issued in 1998</p>

TASK FORCE ON E COLI O157

UPDATE ON GOVERNMENT POSITION IN RELATION TO ACMSF REPORT, PENNINGTON REPORT, AND FATAL ACCIDENT INQUIRY.

STATUS	A	Recommendations not accepted by Government
	B	Recommendations accepted but not acted upon
	C	Recommendations accepted and implemented

Farms & Animals

Recommendation	Status	Note
ACMSF Report		
1. Government funds research in the following areas:		
to establish the incidence/prevalence of <i>E.coli</i> O157:H7 in UK cattle/cattle herds and other agricultural livestock;	C	Awaiting final report.
to improve understanding of the epidemiology of <i>E.coli</i> O157:H7 infections in agricultural livestock and identify the husbandry and other factors contributing to herd infection and control; and	C	Awaiting final report.
Pennington Report		
2. There should be an education/awareness programme for farm workers, repeated and updated periodically as appropriate, to ensure they are aware:	C	
of the existence, potential/prevalence and nature of <i>E.coli</i> O157;		Leaflets for farm workers and animal handlers published and distributed by SAC.
of the potential for the spread of infection on farms in a number of ways, including notably from faecal material, and of the consequent need for scrupulous personal hygiene;		
of the need for care in the use of untreated slurry or manure; and		HSE information sheet on avoiding ill health at open farms published.
of the absolute requirement for the presentation of animals in an appropriate, clean condition for slaughter. (Para 5.17).		Guidance issued – clean livestock.
3. All of this must be backed up by rigorous enforcement by the Meat Hygiene Service at abattoirs. (Para 5.17).	C	Additional training of MHS staff.
All this must be backed up by rigorous enforcement by the Meat Hygiene Service at abattoirs. (Para 5.17)	C	Additional training of MHS staff.

TASK FORCE ON E COLI O157

UPDATE ON GOVERNMENT POSITION IN RELATION TO ACMSF REPORT, PENNINGTON REPORT AND FATAL ACCIDENT INQUIRY

STATUS	A	Recommendations not accepted by Government.
	B	Recommendations accepted but not actioned upon.
	C	Recommendations accepted and implemented.

Abattoirs & Food

Recommendation	Status	Note
ACMSF Report		
1. A dedicated programme of training and continuing in-job development is required in order to create an expert cadre of staff committed to high standards of hygienic slaughterhouse practice. (4.38)	C	
2. Government should fund research on the effectiveness of processing aids, such as carcass washes, in further reducing the microbiological load on carcasses. (4.39).	C	MLC recent research for "sterilising meat".
3. Relevant sectors of the food industry adopt a HACCP-based approach to prevent survival of or contamination by VTEC. (6.63).	C	Prioritising
4. Strongly urge the Government to reconsider its position concerning a ban on the sale of raw cow's milk in England, Wales and Northern Ireland. In the meantime, vulnerable groups in particular should be advised by the Government's Chief Medical Officer not to consume it, and the labelling of raw cow's milk should be altered accordingly. (6.64).	C/A	This was reconsidered but no ban introduced
5. Industry ensures that the pasteurisation of milk and milk products is carefully controlled and that post-pasteurisation contamination is avoided. (6.65).	C	
6. Industry label cheese made from raw milk from cows and other species so that consumers can identify it. (6.66).	B	Curnow report accepted and being published - partly covers this issue – voluntary labelling.
7. Industry label raw minced beef and minced beef products with appropriate handling and cooking instructions. (6.67).		Industry initiative

8.	Endorse the Chief Medical Officer's advice that burgers should be cooked until the juices run clear, and there are no pink bits inside. This advice should be reconsidered when results of the research recommended into the relationship between the formulation and colour of cooked minced meat products, the colour of juices, and the temperature achieved and the survival of VTEC are available. (6.68).	-	Noted ACMSF report endorsed CMO issued revised guidelines
9.	Endorse the Government's advice to cook minced beef and minced beef products including beefburgers to a minimum internal temperature of 70°C for 2 minutes or equivalent. This advice should be reviewed when the results of the relevant research mentioned in R6.10 are known. (6.69).	-	Noted
10.	Industry should ensure that the cooking instructions supplied with beefburgers should be capable of achieving an internal temperature of 70°C for 2 minutes (or equivalent), so that the burger's juices run clear, and there are no pink bits inside. This advice should be reviewed when the results of the relevant research mentioned in R6.10 are known. (6.70).	-	Industry initiative
11.	Persons preparing instructions for the cooking of beefburgers or cooking beefburgers must pay particular attention to the formulation of the burger; its thickness; the methods of defrosting and cooking used, and should monitor the cooking process, taking remedial action when necessary. (6.71).	-	Industry initiative
12.	The Government and industry fund research and surveillance into:- the prevalence of O157 VTEC in raw meats, raw cows' milk, cream made from raw cows' milk and raw milk cheeses;- the nature and extent of the acid resistance of VTEC;- the relationship between the formulation and colour of cooked minced meat products, the colour of juices, and the temperature achieved and the survival of VTEC; and - the effect of sanitisers/disinfectants on the survival of VTEC. (6.72).	C	
Pennington Report			
13.	The Meat Hygiene Service should urgently implement its scoring system for clean/dirty animals, should ensure that official veterinary surgeons and the trade are educated and trained in its use, and should pursue consistent and rigorous enforcement. (Para 6.23).	C	
14.	The Meat Hygiene Service must take forward urgently, with the help and support of Government departments and the industry, the identification and promotion of good practice in slaughterhouses – including specifically in the areas of hide and intestine removal. (Para 6.23).	C	
15.	Abattoir workers should be trained in good hygiene practice during slaughter and the Meat Hygiene Service should concentrate enforcement on slaughter and subsequent handling of carcasses. (Para 6.23).	C	

16	The Hazard Analysis and Critical Control Point system should be enshrined in the legislation governing slaughterhouses and the transportation of carcasses and meat. Meanwhile, enforcers and the trade should ensure that HACCP principles are observed. (Para 6.23).	B	EU proposals presented which would require HACCP approach generally in food businesses. Voluntary adoption of HACCP being promoted.
17.	The Meat Hygiene Service should be given additional powers to enforce at the abattoir standards for the transportation of meat and carcasses between licensed and non-licensed premises. (Para 6.23).		We are unaware of any additional MHS powers that would oversee transportation of health marked meat from licensed to unlicensed premises. However, the Meat (Enhanced Enforcement Powers) Regulations 2000, give Local Authorities the power to take direct action ie to seize meat in any place other than licensed premises which has been illegally produced, stored or transported.
18.	Further consideration should be given, involving the industry and consumer interests, to the potential use and benefits of end-process treatments such as steam pasteurisation. (Para 6.23).	C	MLC funded to take forward
19.	In line with the approach recommended for more general enforcement, the efforts and resources of the Meat Hygiene Service should be targeted at higher risk premises – especially those abattoirs with Hygiene Assessment Scores of under 65. (Para 6.23).	C	
20.	HACCP (i.e. the approach and all 7 principles) should be adopted by all food businesses to ensure food safety. While this is being negotiated into European Union and domestic legislation, implementation and enforcement of the HACCP principles contained in existing legislation should be accelerated. (Para 7.30).	C	European proposals are being progressed. Consultation on Consolidation of Hygiene Directives ended.
21.	The Government should seek to have HACCP enshrined in the review and consolidation of the vertical EU Directives. (Para 7.32).	C	European proposals are being progressed. Consultation on Consolidation of Hygiene Directives ended.
22.	The Government should seek to have all of the HACCP elements negotiated within the Horizontal Directive. (Para 7.32).	C	European proposals are being progressed. Consultation on Consolidation of Hygiene Directives ended.
23.	The Government should review the application of the Meat Products (Hygiene) Regulations 1994, and the guidance issued subsequently, to clarify the position regarding which premises are intended to be covered by the regulations.	B	Revision to guidance actioned by Food Standards Agency
24.	Pending HACCP implementation, selective licensing arrangements for premises not covered by the Meat Products (Hygiene) Regulations 1994 should be introduced by new regulations. (Para 7.32).	C	In place

25. The licensing arrangements should include appropriate requirements for the documentation of hazard analysis, labelling and record-keeping to facilitate product recall and temperature control and monitoring. In relation to training, there should be a requirement for all food handlers to have undertaken at least basic food training and for all supervisory staff (and those who run small, one-person operations) to be trained to at least intermediate level. In addition the licence should cover matters relating to the suitability of premises, equipment and hygiene practices to a level equivalent to that required by the 1994 Regulations. (Para 7.34)	C	In place
26. In relation to the physical separation requirements of licensing:- a. There should be separation, in storage, production, sale and display, between raw meat and unwrapped cooked meat/meat products and other ready to eat foods. This should include the use of separate refrigerators and production equipment, utensils and wherever possible, staff; b. Where the use of separate staff cannot be achieved, alternative standards (such as the the completion and implementation by the operator of a HACCP or the provision and use of additional facilities e.g. for hand washing in the serving area) might be regarded as sufficient to permit the award of a license; c. Where neither a. nor b. above can be achieved, the premises concerned should not be permitted to sell both raw and unwrapped and cooked meat/cooked meat products (although they may be permitted to sell pre-wrapped cooked/ready to eat meat products prepared elsewhere and brought in for that purpose). (Para 7.35).	C	
27. Food hygiene training should be provided wherever possible within the primary and secondary school curriculum. (Para 8.7).	C	
28. Guidance and education about food handling and hygiene should be included in all food and catering education and training courses and should be reinforced through periodic advertising and awareness initiatives. (Para 7.35).	C	
29. Steps should be taken by local authorities to encourage the adoption of HACCP principles in non-registered premises where there is catering for functions for groups of people involving the serving of more than just tea, coffee and confectionery goods. (Para 8.7).	C	
30. Employers should ensure that food handlers, in particular those working with vulnerable groups and/or in sensitive areas such as nursing homes and day-care centres, are aware of and implement good hygiene practice. They should be trained in food hygiene at least to the basic and preferably intermediate level. (Para 8.7).	C	A letter issued from the then Scottish Office.
31. The Government should give a clear policy lead on the need for the enforcement of food safety measures and the accelerated implementation of HACCP. (Para 9.16).	C	

32.	The Government and local authorities should ensure that there are available suitable and adequate Environmental Health Officer skills and resources to address enforcement and education/awareness issues.	C	For Local Authorities in Scotland additional resources provided for Food Safety - monitoring figures show improvement. SFCC report highlights improvements.
33.	The Government should consider earmarking local authority funds for these purposes. (Para 9.16).	C	Not ring-fenced but earmarked funds agreed with COSLA (Scotland only).
34.	Local authorities should designate an environmental health officer, with appropriate training, experience and expertise, to head food safety within the authority. (Para 9.16).	C	
Fatal Accident Inquiry			
Findings			
35.	Experiments be carried out cooking diced raw meat heavily contaminated with the outbreak strain to check the time/temperature relationship necessary to kill off every single organism.	C	ACMSF considering.
36.	Removal of hide to prevent outside coming in contact with raw flesh.	C	Part of MHS clean livestock policy.
37.	Removal of gastrointestinal tract which hosts the organism with care sufficient to prevent the content contaminating the surface of the carcasses.	C	Part of MHS clean livestock policy.
38.	Research into methods such as steam pasteurisation of carcasses should be given every encouragement.	C	See 18.
39.	Precautions to prevent cross-contamination by the wholesaler.	C	Reminders issued 19 August 1997.
40.	Consideration to be given to cold cooked meats being produced only in licensed premises dedicated to that single purpose.	A	Butchers Licensing Scheme implemented.
41.	Where in a butcher's premises ready to eat cooked meats are produced and/or handled it is essential that the processes involved are separated from the raw meat processes so that cross-contamination between cooked and raw meat cannot happen.	C	Butchers Licensing Scheme implemented.
42.	Same surface should never be used for both raw and cooked meats, but if too restrictive – cleaning with an approved bactericide is essential.		Butchers Licensing Scheme implemented.
43.	Cleaning schedules should have been provided.	C	
44.	Different coloured cloths should be used for the raw and for the cooked surfaces.	C	
45.	No appliance, eg vacuum packer, scales, etc, should be used for both raw and cooked materials.	C	

46.	Engagement of a food safety consultant to advise on how to manage safety within the premises.	A	Option for businesses.
47.	Staff should have basic training in food hygiene including cleaning.	C	
48.	Until principles of risk assessment are fully implemented an inspection of a food premises must include: observing what is taking place discussion of procedures with staff identification of weaknesses within the system currently operating assessment of the risks ensuring staff know what to do, are actually doing it, and know what they are doing.	C	Reinforced by EHO training seminars
49.	An inspection should include discussion not only with proprietor, but also with those actually responsible for the cooking process.	C	
50.	Method of cooking should be observed at time of inspection	C	
51.	Steps taken to prevent cross contamination between the cooked product and raw meat or surfaces contaminated with raw meat up to and including the points of sale should be observed at time of inspection.	C	
52.	Inspections of food premises must be thorough	C	
53.	High risk premises should be inspected by more experienced officers	C	
54.	Inexperienced officers should receive training in the identification of risks which different businesses present.	C	
55.	Performance of Enforcement Officers should be monitored to ensure inspections are effective.	C	Local Authority Enforcement Agreement sets standards and new Audit System will monitor – commences 1 st April 2001.
56.	The Sheriff cannot see how the risk assessment system will work unless the proprietor of the business or his hygiene consultant commits their thoughts to paper.		
57.	The establishment of the Food Standards Agency, the Sheriff Principal believes, should reduce the risk of another tragedy	C	
58.	Deals with suggestions for sanitising carcasses at the abattoir (earlier in report Sheriff Principal states further research is Required).	C	
59.	Awareness of the public and of the butchery trade needs to be raised even higher.	C	

60. Safe cooking methods, use of temperature probes and controls to prevent cross-contamination need to be in place.	C	
61. May be a need for further experiments to test the kill rate through cooking of the outbreak strain	A	
62. The Sheriff Principal discusses the risk of cross-contamination of cooked meats in butchers shops and difficulties involving a product recall and implies that a number of ways to reduce these problems could be considered, viz:-a) restricting cooked meat sales to pre-packed and labelled meats, b) improved labelling requirements to facilitate product recall, c) ban cooking unless it takes place in Premises which are entirely separate and there are separate staff and equipment at point of sale.	B	
63. As soon as there is reasonable suspicion that food premises are involved in a serious outbreak the utmost priority should be given to the recall of unconsumed produce. Also it is believed that every step should be taken to alert domestic customers as well as trade when an outbreak occurs.	C	Public Health must override commercial considerations.
64. It is considered that there can be merit in voluntary agreement in some cases – this could be agreement either for closure of premises or in regard to food to be sold. The Sheriff Principal does, however, believe agreements should be in writing and signed by both parties and checks made on compliance.	A	
65. The Sheriff Principal recommends that the Government looks again to see what amendments may require to be made to the Meat Products (Hygiene) Regulations 1994 and subsequent guidance issued to ensure full compliance with Council Directive 92/5/EEC of 10/2/92.	B	

ABBREVIATIONS

ACMSF	Advisory Committee on the Microbiological Safety of Food
ADAS	Agricultural Development and Advisory Service
BOD	Biochemical Oxygen Demand
BRC	British Retail Consortium
BPSU	British Paediatric Surveillance Unit
BSE	Bovine Spongiform Encephalopathy
CCP	Critical Control Point
CMO	Chief Medical Officer
CO	Cabinet Office
COPR	Control of Pollution Regulations
COSHH	Control of Substances Hazardous to Health
CPD	Continuing Professional Development
CSBS	Clinical Standards Board for Scotland
DWI	Drinking Water Inspectorate
EFSIS	European Food Standards Inspection Service
<i>E.coli</i>	Escherichia coli
EFSIS	European Food Standards Inspection Service
EHDs	Environmental Health Departments
EHOs	Environmental Health Officers
EPAST	Electronic Pasteurisation and Sterilisation project
FAI	Fatal Accident Inquiry
FSA	Food Standards Agency
FWMP	Farm Waste Management Plan
HACCP	Hazard Analysis and Critical Control Points
HASWA	Health and Safety at Work Act

HC	Haemorrhagic colitis
HEBS	Health Education Board for Scotland
HMI	Her Majesty's Inspectorate
HSC	Health and Safety Commission
HSE	Health and Safety Executive
HUS	Haemolytic Uraemic Syndrome
HUSH	Hemolytic Uraemic Syndrome Help. UK <i>E.coli</i> Support Group
IID	Infectious Intestinal Disease
IMS	Immunomagnetic Separation
MLC	Meat and Livestock Commission
MAFF	Ministry of Agriculture, Fisheries and Food
MHS	Meat Hygiene Service
MRA	Microbiological risk assessment
NFU	National Farmers Union
NHS	National Health Service
N W WATER	North West Water
OWL	Organic Waste on Land
PEPFAA	Prevention of Environmental Pollution from Agricultural Activity
PFGE	Pulsed-field Gel Electrophoresis
PHLS	Public Health Laboratory Service
PPE	Personal protective equipment
PPET	Pulsed Power Electrotechnologies
QA	Quality Assurance
QC	Quality Control
QMS	Quality Meat Scotland
REHIS	Royal Environmental Health Institute for Scotland

RHET	Royal Highland Education Trust
SAC	Scottish Agricultural College
SAMW	Scottish Association of Meat Wholesalers
SCIEH	Scottish Centre for Infection and Environmental Health
SE	Scottish Executive
SEED	Scottish Executive Education Department
SEERAD	Scottish Executive Environment and Rural Affairs Department
SEHD	Scottish Executive Health Department
SEPA	Scottish Environment Protection Agency
SERAD	Scottish Executive Rural Affairs Department
SERL	Scottish <i>E.coli</i> O157 Reference Laboratory
SFAC	Scottish Food Advisory Committee
SFCC	Scottish Food Co-ordinating Committee
SIDSS	Scottish Infectious Disease Surveillance System
SIGN	Scottish Intercollegiate Guideline Network
SLF	Scottish Landowners Federation
SOAEFD	(former) Scottish Office Agriculture, Environment and Fisheries Department
SRM	Specified Risk Material
SVC	Standing Veterinary Committee
SWAT	Swift Action Team
TTP	Thrombotic Thrombocytopenic Purpura
UV	Ultra Violet
UWWTD	Urban Waste Water Treatment Directive
VLA	Veterinary Laboratory Agency
VTEC	Verocytotoxin-producing <i>E.coli</i>
VTs	Verocytotoxins

WMLR Waste Management Licensing Regulations

WRc Water Research Council

GLOSSARY

Antibody	A protein formed in direct response to the introduction into an individual of an antigen. Antibodies can combine with their specific antigens e.g. to neutralise toxins or destroy bacteria.
Asymptomatic Infection	An infection with a micro-organism where the person infected does not suffer any resulting symptoms or disease.
Buffer Strips	Uncultivated strips of land.
Case Control Study	An epidemiological study in which the characteristics of persons with disease (e.g. their food histories) are compared with a matched control group of persons without the disease or infection.
Epidemiology	The study of factors affecting health and disease in populations and the application of this study to the control and prevention of disease.
Farm Waste Management Plans	Plan detailing collection, storage and disposal of waste, taking account of weather conditions and crop requirements.
Haemolytic Uraemic Syndrome (HUS)	A clinical condition which may arise from a variety of causes, and is characterised by anaemia and kidney failure.
Haemorrhagic Colitis (HC)	Inflammation and bleeding from the large bowel that may be caused by an infectious agent.
IgA, IgG, IgM	Different types of immunoglobulin (antibody) found in body fluids.
Immunomagnetic Separation (IMS)	A technique for isolating a particular micro-organism using magnetic beads coated with antibodies to that organism.
Infectious Dose	The amount of infectious material, e.g. number of bacteria, necessary to produce an infection.
Outbreak	Two or more cases of disease linked to a common source.
Pasteurisation	A form of heat treatment that kills vegetative pathogens and spoilage bacteria in milk and other foods.
Pathogen	Any biological agent that can cause disease.

Phage Typing	A method for distinguishing varieties of bacteria ('phage types) within a particular species on the basis of their susceptibilities to a range of bacteriophages (bacterial viruses).
Sporadic Case	A single case of disease apparently unrelated to other cases.
Strain	A population of organisms within a species or sub-species distinguished by sub-typing.
Thrombotic Thrombocytopaenia Purpura (TTP)	A clinical condition resulting from the aggregation of platelets in various organs, and is characterised by fever with skin and central nervous involvement, anaemia and kidney failure.
Toxin	Any poisonous substance produced by a micro-organism
Verocytotoxin Producing <i>Escherichia coli</i> (VTEC)	A particular sub-species of <i>E.coli</i> often of the serogroup O157 which is associated with haemorrhagic colitis and haemolytic uraemic syndrome.
Virulence	Virulence is defined broadly in terms of the severity of the symptoms in the host. Thus a highly virulent strain may cause severe symptoms in a susceptible individual, which a less virulent strain would produce relatively less severe symptoms in the same individual.

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CHAPTER 3 – RISK

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Mr Mark Aitken	SAC, Ayr
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CHAPTER 4 – DIAGNOSIS, TREATMENT, CARE & PUBLIC HEALTH MANAGEMENT

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Dr Jim Beattie	Royal Hospital for Sick Children, Glasgow
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Dr Martin Donaghy	SE Health Department, Edinburgh
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Dr Sarah O'Brien	PHLS Communicable Disease Surveillance Centre, London
Mrs Julie Preen	Heather Preen Trust, Birmingham
Dr Roland Salmon	PHLS Communicable Disease Surveillance Centre, Cardiff
Dr Norman Simmons, CBE	ACMSF, Guys & St Thomas' Hospital, London
Ms Sharon Smith	HUSH, Motherwell
Dr Andrew Todd	Lanarkshire Area Infectious Diseases Unit, Monklands Hospital, Airdrie
Professor Hugh Pennington	University of Aberdeen, Aberdeen

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CHAPTER 5 - ANIMALS & ENVIRONMENT: UNDERSTANDING THE HAZARD

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Dr David Fenlon	Veterinary Science Division, SAC, Aberdeen
Mr Peter Kenyon	Turriff, Aberdeenshire
Dr Sarah O'Brien	PHLS Communicable Disease Surveillance Centre, London
Dr Giles Paiba	Epidemiology Department, VLA, Weybridge
Mr T Pennycot	Veterinary Science Division, SAC, Ayr
Dr Colin Stewart	Rowett Research Institute
Mr Barti Syngé	Veterinary Science Division, SAC, Inverness

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CHAPTER 6 - ORGANIC WASTE ON LAND

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Mr Mark Aitken	Environment Division, SAC, Ayr
Dr David Fenlon	Veterinary Science Division, SAC, Aberdeen
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CHAPTER 7 - WATER

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Dr Cathy Benton	West of Scotland Water, Glasgow
Mr Jim Dixon	EHD, Perth & Kinross Council, Perth
Dr Martin Donaghy	SE Health Department, Edinburgh
Mr David Drury	Drinking Water Inspectorate, London
Dr David Fenlon	Veterinary Science Division, SAC, Aberdeen
Dr Ken Oates	Highland Health Board, Inverness
Dr Donald Reid	SE Water Services Unit, Edinburgh

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Mr Ian Melville	Countryside & Natural Heritage Countryside Branch, SEERAD
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CHAPTER 9 – FOOD

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CHAPTER 10 – EDUCATION AND COMMUNICATION

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