Department of
Health, Social Services and Public Safety

An Roinn
Sláinte, Seirbhísí Sóisialta agus Sábháilteachta Poiblí

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Northern Ireland Strategy for the Surveillance, Prevention and Control of *E. coli* O157

Northern Ireland *E. coli* O157 Taskforce Report

September 2006

CONTENTS

GLOSSARY

BCH - Belfast City Hospital

CAFRE - College of Agriculture, Food and Rural Enterprises

CCDC - Consultant in Communicable Disease Control

CDSC - Communicable Disease Surveillance Centre (Northern Ireland)

COSSH - Control of Substances Hazardous to Health Regulations

DARD - Department of Agriculture and Rural Development

DCAL - Department of Culture, Arts and Leisure

DE - Department of Education

DEFRA - Department of the Environment, Food and Rural Affairs

DHSSPS - Department of Health, Social Services and Public Safety

DVO - Divisional veterinary Officer

DWI - Drinking Water Inspectorate

EHO - Environmental Health Officer

FSA - Food Standards Agency Northern Ireland

FSPB - ***safe*food**, the Food Safety Promotion Board

HACCP - Hazard Analysis and Critical Control Point

HPA - Health Protection Agency

HSE - Health and Safety Executive

HSENI - Health and Safety Executive Northern Ireland

HSSB - Health and Social Services Board

HUS - Haemolytic Uraemic Syndrome

NIPHL - Northern Ireland Public Health Laboratory (BCH)

RZG - Regional Zoonoses Group

VSD - Veterinary Sciences Division, DARD

VTEC - Verocytotoxic *E. coli*

SUMMARY OF RECOMMENDATIONS

Chapter 2: Epidemiology and Surveillance

2.2.1 (Human surveillance)

1. A survey should be undertaken among all clinical and veterinary bacteriology laboratories to describe current laboratory practice in terms of faecal sampling, standard operating procedures and criteria used for onward referral of specimens to the reference laboratories.
   ACTION: DHSSPS and DARD

2. Laboratories should be encouraged to report human isolates of *E. coli* O157 and subsequent typing information in a timely manner to CCDCs and CDSC.
   ACTION: DHSSPS

3. The questionnaire used for investigation of sporadic human cases of *E. coli* O157 should be reviewed in light of the recent descriptive study and, where possible, harmonised with those used elsewhere in the UK and the Republic of Ireland.
   ACTION: CDSC to lead

4. CDSC should produce an annual report on the epidemiology of *E. coli* O157 infection in Northern Ireland for submission to the Regional Zoonoses Group.
   ACTION: CDSC

5. CDSC should explore with paediatric and renal physician colleagues how clinical case reports of haemolytic uraemic syndrome can be linked with laboratory reports of *E. coli* O157.
   ACTION: CDSC

6. Consideration should also be given to alternative ways of integrating a minimum data set of clinical, epidemiological and laboratory data, for example, through establishing a Northern Ireland *E. coli* O157 Register such as those developed in Scotland and in the Republic of Ireland.
   ACTION: DHSSPS

2.2.3 (Animal surveillance)

7. It is recommended that, where possible, Northern Ireland should participate in UK and/or Republic of Ireland food and animal surveys in order to obtain comparable data on *E. coli* O157 and to monitor trends. If required, food and animal surveys in Northern Ireland should be undertaken in the absence of a contemporaneous survey in GB. The need for, and outcome of, these surveys should be considered with the human epidemiology and discussed by the Regional Zoonoses Group.
   ACTION: DARD, FSA, and RZG

8. Currently CCDCs may request when considered appropriate that DARD Veterinary Service investigates a farm with definite links to a specific human case of *E. coli* O157. It is recommended that (a) standardised criteria for requesting a farm investigation are developed, (b) the information gathered is collated and included in the annual report on the epidemiology of *E. coli* O157 recommended above and (c) liaison between CCDCs and DARD should be via the Divisional Veterinary Officer with responsibility for zoonoses.
ACTION: DARD and DHSSPS

Chapter 3: Clinical Diagnosis and Management in Humans

3.2 (Microbiological diagnosis)

9. All human faecal samples should be examined for presumptive *E. coli* O157 by inoculation on Sorbitol McConkey Agar (SMAC).
ACTION: DHSSPS

10. For outbreaks, or when advised, laboratories should use an enrichment stage using modified Tryptone Soya Broth.
ACTION: DHSSPS

11. All human isolates of *E. coli* O157 should be sent both to the BCH for toxin testing and the Centre for Infections, Colindale for phage typing and confirmatory toxin testing.
ACTION: DHSSPS

3.3 (Public health management)

12. Sporadic human cases and outbreaks of *E. coli* O157 should be managed in accordance with the Health Protection Agency (HPA) guidelines.
ACTION: DHSSPS

Chapter 4: Prevention and Control

4.1 (Preventing contamination of water supplies)

13. It is recommended that owners of single household private water supplies be advised that their water supplies should be microbiologically tested.
ACTION: District Councils

14. It is recommended that animals and animal slurry and manure be managed in a manner that does not contaminate wells and other water supplies in accordance with guidance provided by DARD for the farming community.
ACTION: DARD

4.4 (Preventing contamination of the food chain)

15. It is strongly advised that unpasteurised milk is not consumed. Farming families and visitors to farms are advised to either buy pasteurised milk for home consumption or to pasteurise their own milk with a reliable home pasteuriser.
ACTION: DARD, FSA and FSPB

16. The current programme of education and reinforcement of messages concerning good personal hygiene and safe food handling practices for food businesses and consumers should be maintained. This type of advice should be easily accessible.
ACTION: FSA, District Councils and FSPB

4.6 (Education, advice and raising awareness)

17. All open farms and related activities presenting similar risks should receive information/advice every two years (or sooner if updated/revised guidance becomes available) on minimising the risk to staff and visitors from *E. coli* O157.
ACTION: HSENI and District Councils

18. All schools should receive information/advice every two years (or sooner if updated/revised guidance becomes available) regarding the risks posed by visits to open farms and appropriate precautionary measures to minimise the risk of *E. coli* O157 infection.
ACTION: HSENI and DE

19. Farmers and farm families should receive information/advice every two years (or sooner if updated/revised guidance becomes available) on the risks of *E. coli* O157 and appropriate precautionary measures to minimise their risk of infection. This should be included as part of a generic programme on infection risks on farms.
ACTION: HSENI and DARD

20. Specific advice on *E. coli* O157 should be included in formal training on zoonoses for agricultural trainees at the College of Agriculture, Food and Rural Enterprises (CAFRE) at Greenmount campus.
ACTION: DARD

21. All farmers should receive information/advice every two years (or sooner if updated/revised guidance becomes available) on the correct management of slurry and manure including its use in fruit and vegetable production.
ACTION: DARD and FSA

22. All institutions within the community, including residential and nursing homes, crèches, schools and daycare centres, should have access to community infection control advice.
ACTION: DHSSPS

23. All schools (including pre-schools, crèches and daycare centres) should have adequate hygiene facilities in terms of scale of provision to meet relevant statutory standards. It is also important that management arrangements ensure that cleaning regimes and the provision of hygiene materials are sufficient to minimise cross infection risks.

ACTION: DE

24. Where the use of land by the public, or by organised groups falls within a definition of business use, relevant enforcing authorities should seek to ensure that landowners are made aware of their responsibilities to undertake and act upon the outcomes of risk assessments for biological risks. Sports governing bodies and those bodies directing the activity of youth organisations that may access land otherwise used as animal pasture should ensure the availability and dissemination of advice and precautions to be taken to minimise the risk of infection from *E. coli* O157.

ACTION: District Councils, HSENI and DCAL

CHAPTER 1

Introduction

1.1 Background

Escherichia coli (E. coli) is a type of bacteria which has many different strains. Some of these strains live harmlessly in the gastrointestinal tracts of humans and animals, but some are associated with gastrointestinal illness. The different strains are classified into six main categories, of which Verocytotoxic *E. coli* (VTEC) causes the most serious illness in humans.

The most common strain of VTEC is *E. coli* O157, which has emerged as a major public health concern during the 1990s. *E. coli* O157 was first recognised as a cause of illness in humans in 1982 in the USA when two outbreaks of abdominal pain and bloody diarrhoea were linked to the consumption of inadequately cooked hamburgers[1]. Since then *E. coli* O157 infections have been reported in over 80 countries worldwide, with the highest rates in the USA followed by Canada, and Scotland[2].

E. coli O157 may cause sporadic human illness but also has the capacity to cause large outbreaks, with the potential for secondary spread from person-to-person. It is of particular concern as *E. coli* O157 may result in an infected individual developing a form of renal failure, haemolytic uraemic syndrome (HUS), which, in some cases, can cause death**.**

1.2 The Northern Ireland Taskforce

The *E. coli* O157 Taskforce, chaired by Dr George McIlroy, Chief Scientific Officer, Department of Agriculture and Rural Development (DARD), was established in June 2003 as a subgroup of the Regional Zoonoses Group (RZG). It was established following the reports of the Scottish Taskforce and the Food Safety Authority of Ireland on *E. coli* O157 available at **www.scotland.gov.uk/deleted/library3/health/ecoli-00.asp** and **www.fsai.ie/publications/reports/ecoli_report.PDF** in order to develop a Northern Ireland strategy for the surveillance, prevention and control of *E. coli* O157.

The membership included expertise in epidemiology, public health, veterinary medicine, microbiology, environmental health and food safety (the membership is listed in the Appendix). The group decided on the relevant topics to be described and reviewed within the strategy, and expert opinion was utilised both from within and outside the core group. The major focus of this report is to minimise the risk of human cases of *E. coli* O157.

Although this strategy is concerned primarily with *E. coli* O157, the group envisaged that there would also be an impact on other zoonotic diseases. It is important to recognise that some of the general recommendations regarding prevention in this report will have the potential to affect the incidence of other zoonotic gastrointestinal infections, such as

campylobacter. Consequently, the impact of this report could be wider than initially appreciated.

1.3 Clinical features

E. coli O157 infection, is associated with an extremely low infectious dose (around 10 to 100 organisms) which may facilitate spread from person to person, especially where hygiene conditions are poor and faecal-oral spread may be possible[3]. The incubation period ranges from 1 to 8 days. *E. coli* O157 infection can occur at any age but usually affects the very young and the elderly. *E. coli* O157 can present with a wide range of symptoms, or it may be asymptomatic. Initial symptoms are usually abdominal pain, stomach cramps and non-bloody diarrhoea. In some cases, the diarrhoea may become bloody, leading to haemorrhagic colitis. Usually 3% - 7% of cases progress to HUS, the most serious complication of *E. coli* O157. HUS is characterised by a sudden onset of haemolytic anaemia and followed by acute renal failure[4]. The mortality rate from HUS is around 5%. Complications are also more common among the young and the elderly.

1.4 Routes of exposure

For a human to become ill, they must come into contact with the organism and this may occur in several ways:

- Direct contact with the animals or their faeces (occupational or visiting farms)
- Recreational use of land
- Contaminated water
- Contaminated food
- Person-to-person spread

The main reservoir of *E. coli* O157 is the gastrointestinal tract of ruminant animals, particularly cattle and sheep, although the organism has also occasionally been isolated from a range of other species, including pigs, rodents, and wild birds. Animals excreting *E. coli* O157 are normally asymptomatic (i.e. they do not become ill). Studies in Great Britain have shown that *E. coli* O157 is present in approximately 4.7% of cattle and 1.84% of sheep at slaughter[5]. *E. coli* O157 in the gut of the animal or on its coat can potentially contaminate the carcass at slaughter. Excretion of the organism in the faeces also leads to contamination of grass and soil, either directly in the case of a grazing animal or, indirectly, through the spreading of animal waste slurry and manure on land.

Run-off in wet weather can further lead to the contamination of watercourses, springs and boreholes. Once infected, humans excrete the organism in their faeces, and person-to-person spread can occur, particularly in situations where hygiene is compromised.

While much of the focus on food sources has been on animal products, contamination of fruit and vegetables can occur from soil and /or irrigation water. An outbreak affecting 70 people on the US west coast was caused by the consumption of unpasteurised apple juice,

and several outbreaks in Japan have been attributed to radishes[6], [7]. Outbreaks associated with lettuce leaves have been discovered in the USA[8].

There is evidence of a seasonal variation in the incidence of *E. coli* O157 cases, with infections more common over the summer months, as illustrated in Fig. A (page 19). This variation may be as a result of the warmer climate influencing lifestyles and environmental exposures, thus increasing the risk of infection.

1.5 Microbiological features

The term VTEC includes those disease-causing strains of *E. coli* that are capable of producing one or more toxins that kill Vero cells. There are two types of gene responsible for producing Verocytotoxin: VT1, and VT2. *E. coli* O157 can present with VT1 only, VT2 only, both, or occasionally with neither. Most produce VT2, but the percentage that also produce VT1 varies across the world, over 80% in N. America and Japan, but less than 25% in Europe.[9]

CHAPTER 2

Epidemiology and Surveillance

2.1 Epidemiology in humans

E. coli O157 infection although serious is not common – in recent years there have been between 30 and 50 reports per year in Northern Ireland and the vast majority are Verocytotoxigenic (Fig. D, page 21). This is equivalent to rates of between 1.8 to 2.9 cases per 100,000 population. Most of these laboratory reports were from symptomatic individuals.

In the UK, Scotland has the highest incident rates followed by Northern Ireland. The rates in Scotland have fallen since their peak in 1995 and are now similar to those in Northern Ireland (Fig. E, page 21)

The epidemiology of *E. coli* O157 in Northern Ireland between 1998 and 2001 was described in a study coordinated by the Communicable Disease Surveillance Centre Northern Ireland (CDSC). The information was captured on a common questionnaire used by each Consultant in Communicable Disease Control (CCDC) when following up a report of *E. coli* O157. There follows a summary of this descriptive study.

One hundred and eighty nine cases were reported by laboratories between 1998 and 2001. This compares with 3,523 laboratory reports of campylobacter and 2,015 reports of salmonella during the same time period. Forty (21%) reports of *E. coli* O157 were associated with outbreaks, 48 (25%) were asymptomatic individuals, often family members, identified through screening of household and other contacts, and the remaining 101 (53%) were sporadic cases.

Sporadic cases (n = 101)

Cases were almost equally distributed between males and females (F=51.5%). The mean age of cases was 24 years (median age: 16 years). The highest age specific incidence rate was in children aged under four years (31/100,000 population). Hospitalisation was reported in 44 (44%) cases. Of those, 10 (23%) were under 5 years of age, and 17 (39%) were aged between 15 and 44 years. No deaths were reported among cases notified. The incidence rate in the NHSSB of 11.7 cases per 100,000 of population was between two to three times higher than that noted in the other HSSBs (Fig. B, page 20). There is a seasonal influence with cases generally more common in the July/September quarter.

Information on occupation of cases was available for 56 (55%) cases. Among those who provided information on occupation, 10 (8%) were working as/in a food handling capacity: a cook supervisor, supermarket, restaurant, or worked in a community setting (i.e. school restaurant, classroom assistant) and nine were students. Six cases were health care workers including two microbiology laboratory staff. Although none of the cases was directly employed in agriculture, one was a retired farmer.

Information was sought on known risk factors for *E. coli* O157 such as contact with animals and other symptomatic individuals, handling of raw meat/meat products, consumption of unpasteurised dairy products, unwashed fruit and vegetables, and drinking non-mains water.

Information on regular contact with animals was available in 100 (99%) cases. Forty-six had regular contact with animals and of those, sixteen (36%) reported contact with cattle, three (7%) with sheep, seven (15%) with poultry and thirty-three (71%) with dogs. Of those who had contact with animals in the eight days prior to illness, eighteen (40%) visited a farm, and among those, ten touched animals during their visit. One case had contact with sick animals. In sixteen (17%) cases at least one other household member had contact with one or more specific animals, as part of their occupation.

Sixty-three (66%) cases consumed beef, or food containing beef in the eight days before they became ill. The most commonly consumed beef products were hamburgers (18 cases; 19%) and minced beef (26 cases; 27%) in the eight days preceding illness. Nine (9%) reported consuming undercooked beef products, and seven (7%) cases consumed other meat products that were reportedly undercooked in the eight days before illness**.**

Eighteen cases handled raw meat (18%), ten handled raw poultry (10%), twenty-four handled raw fruit (24%), and twenty-eight (28%) handled raw vegetables in the eight days before illness.

Seventy one (70%) cases had eaten raw fruit in the 8 days proceeding illness, and only 46 of them washed the fruit before consumption, 42 (42%) cases had eaten raw vegetables in the eight days before illness, and only 28 washed them before consumption.

Eight (8%) cases consumed unpasteurised milk and of these five (63%) were aged 0-4 years (median = 1.5 years).

Eighty-six (85%) cases obtained their water from the mains supply only, however, six (6%) cases drank water from a well.

Seventeen (17%) cases travelled outside Northern Ireland in the eight days before they became ill with the majority (11 cases) having travelled within the Republic of Ireland.

The distribution of *E. coli* O157 phage types (PT) has changed over the four-year period with a marked annual increase in PT 21/28 (Fig. C, page 20). In 2001 this phage type accounted for 19 (19/36, 53%) of the sporadic cases compared with none in 1998. The next most common phage type was PT 32 which has declined in absolute and relative terms between 1998 and 2001. The distribution of phage types by Health and Social Services Board (HSSB) also differs with phage type PT 21/28 accounting for the majority in the EHSSB (19/26, 73%) while PT 32 (13/44, 30%) and PT 21/28 (13/44, 30%) are the main phage types in the NHSSB (Fig. B, page 20). Seventy-three (84%) of the sporadic cases had Verocytotoxin genes VT2 and ten (11%) had VT1 and VT2 genes.

As this was a descriptive study exposure to these known risk factors does not necessarily imply causation. However, it confirms that many cases had exposure to one or more recognised risk factors for *E. coli* O157.

HUS

Fifteen cases (11%) of HUS secondary to *E. coli* O157 infection were reported in years 1998-2000 in Northern Ireland among children (0-14 years). Case questionnaires were available for six (46%). Three occurred in children aged 0-4 years, two in the age group 5-9 years, and the remaining one was 14 years old. Four were associated with *E. coli O157* infection phage type (PT) 21/28, one with PT 4, and in the remaining case phage typing was not confirmed. Five were VT2 positive. All HUS cases were hospitalised. No particular symptom was associated with the likelihood to develop HUS.

Outbreaks

Between 1998 and 2001, four outbreaks due to *E. coli O157* were reported in Northern Ireland accounting for 40 confirmed cases.

Details on those outbreaks are as follows:

1. In August 1998, a cluster of four cases occurred in a group of eight people residing in a house next to agricultural land in the EHSSB. A bovine faecal specimen collected from the field adjacent to the dwelling was positive for *E. coli O157*. No other cases of *E. coli O157* were identified in the surrounding community, despite enhanced surveillance by local GPs. In that occasion it was not possible to determine the source or vehicle of the transmission in this cluster. *(CDSC NI Monthly Report weeks 25-28/98 Vol 7 No 7).*

2. In January 1999 a large family outbreak involving 12 confirmed cases occurred in the EHSSB. All had the same phage type (PT32 VT2). The suspected mode of transmission was person-to-person, but the source of infection was not identified.

3. In March 2000, *E. coli* O157 was isolated from eight individuals attending a nursery school in the NHSSB, all of whom were symptomatic. Person-to-person transmission was thought to be the cause of the spread of the outbreak. (*CDSC NI Monthly Report weeks 25-28/2000 Vol 9 No 7*)

4. In June 2001**,** an outbreak of *E. coli* O157 occurred in a nursery school in the EHSSB. Sixteen people were affected. However the source of infection and the mode of transmission were not identified.

2.2 Current surveillance arrangements

2.2.1 Human surveillance

E. coli O157 is not specifically listed as one of the notifiable diseases that doctors are required to report on clinical suspicion to the Director of Public Health. However it could be notified as a cause of food poisoning which the Advisory Committee on the Microbiological Safety of Food (ACMSF) defines as "any disease of an infectious or toxic nature caused by or thought to be caused by the consumption of food or water". Legislation determines that the notification details only include the patient's name, address, age and sex.

The hospital clinical microbiology laboratories voluntarily report isolates of *E. coli* O157 to the relevant CCDC. All such laboratories have been requested by DHSSPS since the mid 1990s to examine all diarrhoeal faecal specimens for this organism. While all laboratories now examine all diarrhoeal faecal specimens for this pathogen it is not known if all laboratories use the same detection method.

The CCDC on receipt of a notification of food poisoning or laboratory report of *E. coli* O157 forwards this to the local Environmental Health Department whose staff then interview the patient and collect relevant clinical, food and other risk factor information. Appropriate infection control advice is provided during this face-to-face interview. For food poisoning investigations (with the exception of *E. coli* O157) CCDCs use their own food poisoning enquiry forms which are similar but not identical between the HSSBs. If the investigation relates to a patient known to be excreting *E. coli* O157, a standard questionnaire is generally used by all CCDCs.

This questionnaire, which contains clinical details and epidemiological risk factors, is retained by the CCDC. The questionnaire does not contain outcome information and as HUS can be a relatively late manifestation of acute infection with *E. coli* O157 such complications may not be apparent when the patient is being interviewed shortly after infection is detected. Should exposure to farm animals be identified as a possible risk factor, the CCDC will liaise with the Divisional Veterinary Officer (DVO) regarding on-farm investigation and clinical and environmental samples for microbiological analysis. The outcome of these on-farm investigations would be retained by the CCDC and DVO and not normally held centrally.

The Communicable Disease Centre Northern Ireland (CDSC) receives weekly from each HSSB the aggregate number of each notifiable disease disaggregated by Community Trust. No named or age/sex data is provided. CDSC also receives laboratory reports of *E. coli* O157 at varying intervals from each laboratory. This will include definitive typing results if the sample has been sent to the reference laboratory. CDSC validates its *E. coli* O157 data on an annual basis with that held by the Northern Ireland Public Health Laboratory (NIPHL) at Belfast City Hospital.

The Northern Ireland data is forwarded to the Centre for Infections, Colindale to be linked and compared with similar data from England, Wales and Scotland. These datasets are then presented to national groupings such as the Food Standards Agency's Epidemiology of Foodborne Infection Group and published in the annual UK Zoonoses Report.

Recommendations 1-6

1. To enable a detailed description of *E. coli* O157 infection in Northern Ireland requires the adoption (if not already in place) of recognised laboratory standard operating procedures (SOPs). A survey should therefore be undertaken among all clinical and veterinary bacteriology laboratories to describe current laboratory practice in terms of faecal sampling, SOPs and criteria used for onward referral of specimens to the reference laboratory. Not only would this facilitate harmonisation in Northern Ireland it would also contribute to ensuring laboratory practice was consistent with GB and the Republic of Ireland.

2. Laboratories should be encouraged to report human isolates of *E. coli* O157 and subsequent typing information in a timely manner to CCDCs and CDSC. This will be further enabled by the rollout by CDSC of electronic reporting software (CoSurv).

3. Currently CCDCs use a standard questionnaire for investigation of reports of *E. coli* O157. This questionnaire has been in use for many years. This questionnaire should be reviewed in light of the recent descriptive study and, where possible, harmonised with those used elsewhere in the UK and the Republic of Ireland.

4. CDSC should produce an annual updated descriptive report on the epidemiology of *E. coli* O157 infection in Northern Ireland in a similar manner to that undertaken for tuberculosis, meningococcal infection and influenza. This report would be presented to the RZG. To enable this to be undertaken, it is recommended that CCDCs forward completed investigation reports, including outbreaks, and questionnaires to CDSC. Such a report would also require liaison with DARD and the NIPHL to include a summary of the outcome of associated on-farm investigations or other animal surveillance activities and if *E. coli* O157 was isolated from food or water.

5. As noted earlier, complications of *E. coli* O157 such as HUS and death may not be reported to the CCDC and therefore an annual report based on initial interviews with patients could underestimate the associated morbidity from this infection. Many of those developing HUS will be children and the elderly both of whom may require renal dialysis. CDSC should therefore explore with paediatric and renal physician colleagues how clinical case reports of HUS can be linked with laboratory reports of *E. coli* O157.

6. Consideration should also be given to alternative ways of integrating a minimum data set of clinical, epidemiological and laboratory data, for example, establishing a Northern Ireland *E. coli* O157 Register such as those developed in Scotland and in the Republic of Ireland.

2.2.2 Food surveillance

Environmental Health Departments undertake a range of food sampling activities and, in respect of microbiological sampling, will generally take part in regional or national co-ordinated surveys where these are identified as necessary by regional liaison groups, or recommended and co-ordinated by HPA, FSA, LACORS or other such bodies. Specific surveys seeking to identify *E. coli* O157 are not frequently undertaken, but prepared foodstuffs found on examination to show indicator organisms suggesting possible faecal contamination or cross-contamination from raw meats would be further examined, with *E. coli* O157 being one of the organisms considered.

On notification of a case or outbreak of *E. coli* O157, EHOs will interview cases to establish relevant history and risk factors, and will seek to sample foods consumed during the incubation period where these are available. This together with checks carried out on food handlers, and their food handling and storage practices in any relevant food businesses is intended to reduce the risk of further cases of disease.

A food surveillance database is under development in Northern Ireland funded by ***safe*food**, the Food Safety Promotion Board (FSPB) and will provide information on microbiological norms and trends once populated with data.

2.2.3 Animal surveillance

E. coli O157 is not generally associated with clinical disease in animals. Information on the occurrence of the organism in animal populations is therefore limited to specific surveys/research projects or the occasional isolate from routine diagnostic submissions.

E. coli O157 is not specifically listed as one of the notifiable diseases that veterinary surgeons or laboratories are required to report to an officer of DARD. Considering the endemic nature of the organism in the farm animal population, no government action is taken on isolation of the organism from routine diagnostic samples.

Information on animal surveillance studies for *E. coli* O157 in Great Britain, Northern Ireland and the Republic of Ireland is summarised below.

Great Britain

1. **GB abattoir pathogen prevalence studies**

   Two series of pathogen prevalence studies involving cattle, sheep and pigs at slaughter have been undertaken by DEFRA in Great Britain. These studies

involved testing for the faecal carriage of a range of zoonotic pathogens including *E. coli* O157, Salmonella, Campylobacter, Yersinia, plus antimicrobial resistance testing of pathogens isolated and indicator commensal organisms, such as *E. coli* and *Enterococcus spp*.

In the first series of studies, carried out in 1999/2000, VTEC O157 was found in 4.7% (95% confidence interval 4.1 - 5.4) of cattle, 1.7% (1.3 - 2.1) of sheep and 0.3% (0.1 - 0.6) of pigs[5]. In the second series of studies carried out in 2003, the prevalence of VTEC O157 carriage in cattle and pigs was again 4.7% (95% CI 3.9- 5.6) and 0.3% (0.06-0.5) respectively. In sheep, the prevalence found in 2003 (0.7 per cent; 95% CI 0.5-1.1) was significantly lower than in the previous 1999/2000 study.

2. **On-farm studies in Scotland**

In a study of 12-30 month old beef cattle carried in Scotland between April 1998 and May 2000 *E. coli* O157 was found in 8.6% (95% CI 7.3-10.0%) of animals and 23.7% (21.0% - 26.5%) of herds[10]. In a second study designed to investigate factors that might influence the shedding VTEC O157 in beef cows, 4.2% of faecal samples were found to be positive for the organism[11].

3. **On-farm study in England and Wales.**

A VLA on-farm survey between June and December 1999 involved tests on 4663 cattle on 75 farms in England & Wales. The overall prevalence of excretion by individual cattle was 4.2% (95% CI 2.0 to 6.4), with at least one positive animal identified on 29 (38.7%; 95% CI 28.1 to 50.4) of the farms, including dairy, suckler and fattening herds. The prevalence of excretion was least in the calves under two months of age, peaked in the calves aged between two-six months and declined thereafter. A higher percentage of fattening herds were positive (46.7%) than either suckler (42.4%) or dairy herds (29.6%) but the differences were not statistically significant[12].

Northern Ireland

While there have been no equivalent studies to the GB abattoir prevalence surveys, a number of specific studies for *E. coli* O157 have been carried out in Northern Ireland over the last 8-9 years. These have included:

Surveys of enteritis samples from cattle

4. In a survey by Veterinary Sciences Division (VSD), DARD of 508 bovine faecal samples that had been submitted for diagnostic (clinical) purposes during 1994/1995, *E. coli* O157 was detected in 11 samples (2.2%). Of these 9 (1.8% of total) were verocytotoxin positive. In an abattoir survey of swabs from 700 carcasses, carried out by Food Science Division DARD at the same time, no isolates of *E. coli* O157 were found[13].

5. As part of a Food Standards Agency funded project on improving detection methods, 400 bovine faeces samples from enteritis cases submitted to VSD for diagnostic purposes during October to December 2002, were examined for *E. coli* O157 by IMS. No *E. coli* O157 strains were isolated from the 400 samples tested[14].

On-farm follow-up sampling (associated with human clinical disease)

6. Since 1998, VSD has been involved in investigations into the possible link between human *E. coli* O157 associated disease in farming families and cattle kept on these farms, in Northern Ireland. The investigations have been initiated, in each case, by the local HSSB, and samples taken by the local Divisional Veterinary Office. In an analysis of the results from 12 farms over a 4-year period, VTEC O157 strains were isolated from animals on six (50%) occasions. Overall 10.3% of animals (54 out of 522), and 16.6% of animals from positive farms, tested positive. The within-herd prevalence on the 6 positive farms varied from 1% to 60%. In five of the herds, a phage-type corresponding to that of the human case was isolated from the cattle[15, 16].

Abattoir and dairy environmental sampling

7. In a study by the Food Science Department, Queen's University Belfast 480 environmental samples were collected between June 1999 and June 2000 from two abattoirs in Northern Ireland. The samples were collected from a range of sites including conveyor belts, chopping boards, stainless steel tables, trim bins, aprons, floors and drains using 6 x 8 cm sterile sponges. Two of the 480 samples (0.4%) tested positive for VTEC[17].

   In a further study carried out at the same time, 420 samples were collected from two Northern Ireland dairies. The samples were collected from sites from raw milk silos, raw milk tankers, clarifier and separator de-sludge units, balance tanks and drains. Overall, nine (2.14%) of samples tested positive for VTEC[17].

Republic of Ireland

The prevalence of serogroup *E. coli* O157:H7 has been indicated in studies. Studies by the National Food Centre, Teagasc and University of Ulster examined the prevalence of *E. coli* O157:H7 on bovine hide (n= 1500; O'Brien et al, 2005[18]), beef carcasses (n= 132; Carney et al, 2005[19]), beef head meat (n=100; *ibid*) and beef trimmings (n=1351; *ibid*) at a beef slaughter plant in the Republic of Ireland, and also burgers/minced beef (n=1533) at retail level (Cagney et al, 2004[20])

These data indicated a prevalence of serogroup O157 of 7.3% (n=109), 3.0% (n=4), 3.0% (n=3), 2.4% (n=32) and 2.8% (n=43) on bovine hide, beef carcasses, beef head meat, beef trimming and burgers/minced beef, respectively. Further analysis detected verotoxin

genes in 98, 4, 3, 30 and 43 of the isolates obtained from bovine hide, beef carcasses, beef head meat, beef trimming and burgers/minced beef, respectively.

Abattoir study
In a study by Teagasc and the University of Ulster, McEvoy *et al*[21] isolated *E. coli* O157:H7 from 2.4% of faecal samples, 0.8% of rumen contents and 3.2% of carcass samples taken from 250 animals over a year long period from June 1988 to May 1999 at a single Irish abattoir.

Herd prevalence study 2002-2004
In a dairy herd contamination study commissioned by ***safe*food**, the Food Safety Promotion Board, the prevalence of *E. coli* O157 in 97 herds was found to be 12%. In this work in-line milk filters were tested for *E. coli* O157 using IMS and subsequent isolation on SMAC, before serological and genotypic characterisation.[22]

Recommendations 7 and 8

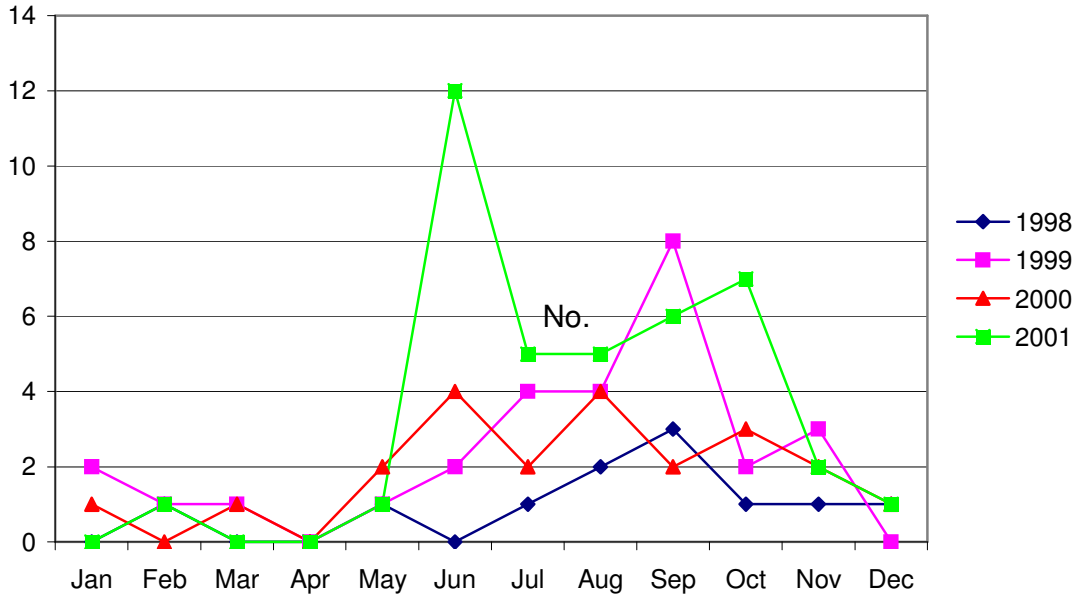
7. Surveys have been undertaken in GB for the presence of *E. coli* O157 and other pathogens in animals at slaughter, notably cattle, sheep and pigs and also in the Republic of Ireland in respect of animals at slaughter[23], raw milk filters[24] and food items such as minced beef, beef burgers and smear-ripened cheeses[25].

   It is recommended that, where possible, Northern Ireland should also participate in such food and animal surveys in order to obtain comparable data on *E. coli* O157 and to monitor trends. If required, food and animal surveys in Northern Ireland should be undertaken in the absence of a contemporaneous survey in GB. The need for and outcome of these surveys should be considered with the human epidemiology and discussed by the RZG.

8. Currently CCDCs may request when considered appropriate that DARD Veterinary Service investigates a farm with definite links to a specific human case of *E. coli* O157. To further maximise the value of such investigations, it is recommended that (a) standardised criteria for requesting a farm investigation are developed; (b) the information gathered is collated and included in the annual report on the epidemiology of *E. coli* O157 recommended above; and that (c) liaison between CCDCs and DARD should be via the DVO with responsibility for zoonoses.

Figure A Distribution of *E. coli* O157 sporadic cases by year and month of notification

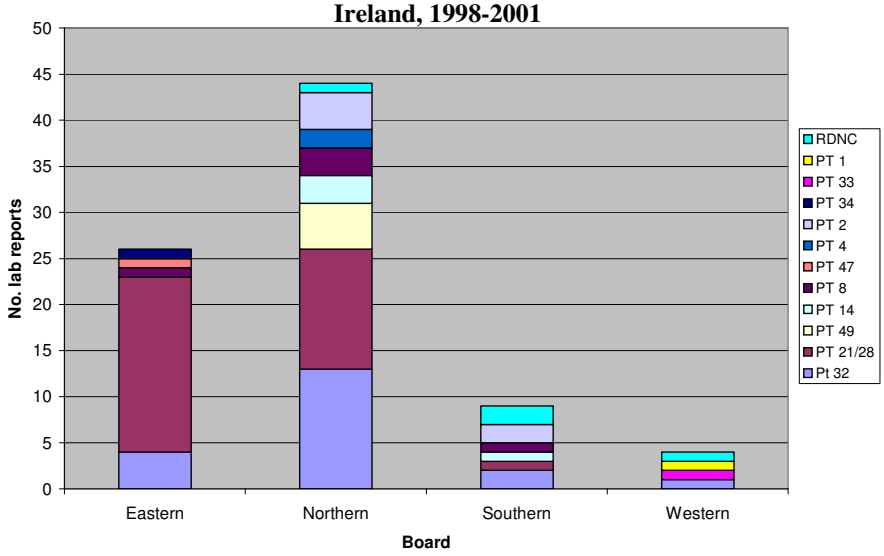
Northern Ireland 1998-2001



Month

Source: CDSC

Figure B ***E. coli*** **0157 phage types by HSSB, Northern Ireland, 1998-2001**



RNDC = reacts but does not confirm

Source: CDSC NI

Figure C ***E. coli*** **O157 phage types by year in Northern Ireland 1998–2001**

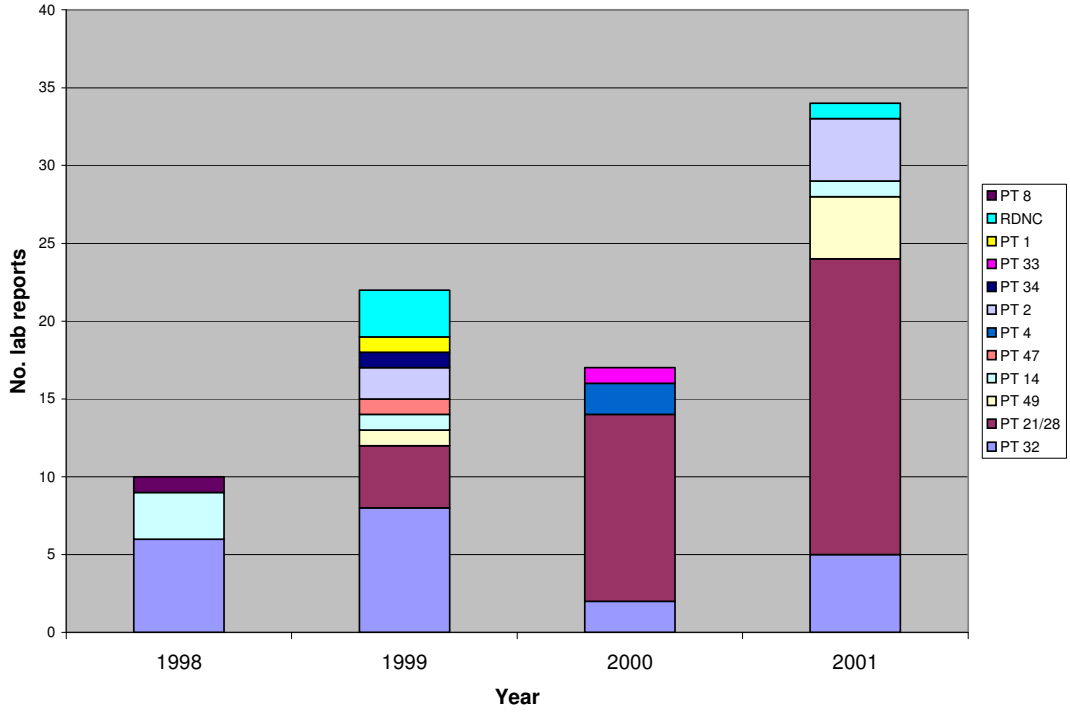


Figure D Laboratory reports of E. coli O157 and VTEC
Northern Ireland, 1990 - 2003

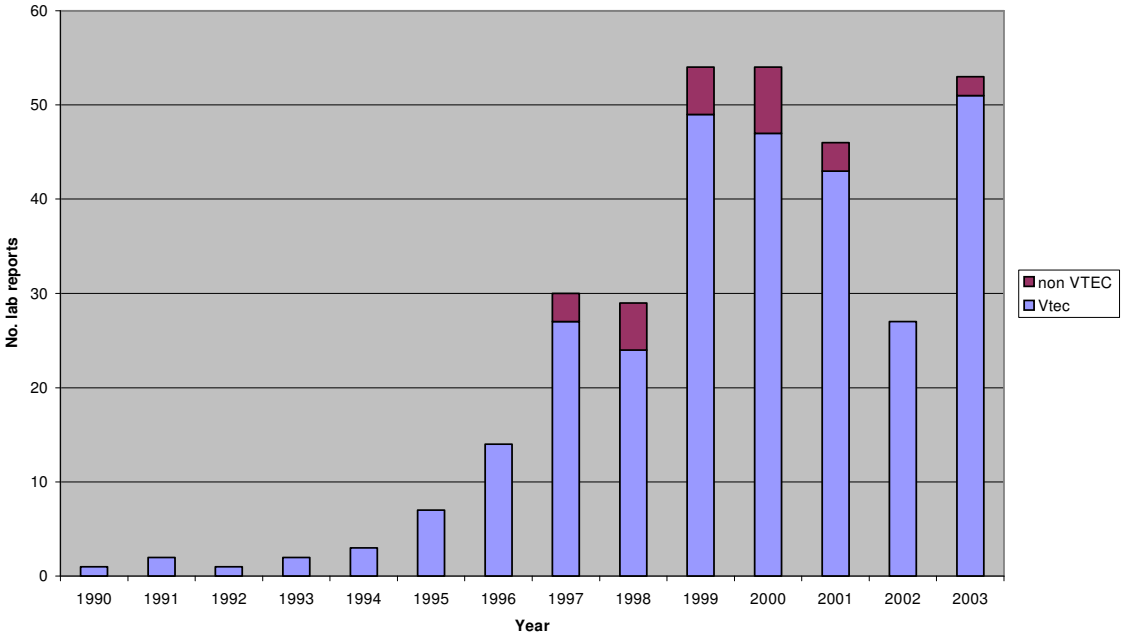
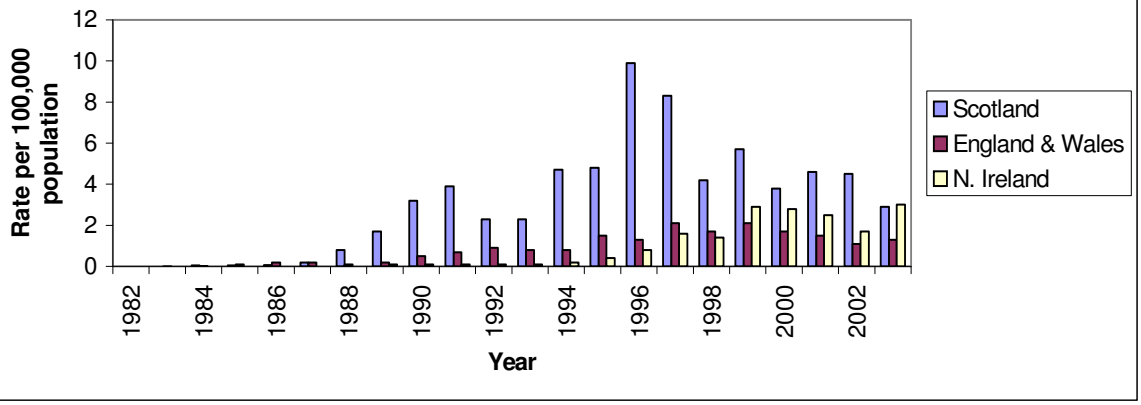


Figure E Laboratory confirmed reports of VTEC O157 in people 1982-2003



Source: HPA/CDSC, (Colindale), SCIEH, CDSC

CHAPTER 3

Clinical diagnosis and management in humans

3.1 Clinical symptoms and management

Infection with *E. coli* O157 may cause no symptoms, or a range from mild diarrhoea to abdominal pain and diarrhoea with red blood (haemorrhagic colitis). The infection is usually self-limiting within seven days but one third of cases will require hospital admission. *E. coli* O157 infections have the potential to cause HUS in approximately 2% to 7% of cases. This is a serious condition with renal failure, haemolytic anaemia and thrombocytopenia. This may occur 2 to14 days after the onset of diarrhoea. Risk factors for HUS include children under 5 years, elderly, a high white cell count and anti-diarrhoeal drugs.

The correction and maintenance of fluid and electrolyte balance is important in the management of *E. coli* O157 infections. HUS should be monitored for regularly. Anti-motility agents are not recommended. The role of antimicrobial agents is uncertain and they have not been shown convincingly to either alter the course of the infection or the duration of excretion of the organism.

Hygiene advice should be given to cases and contacts, especially regarding hand-washing.

3.2 Microbiological diagnosis

Currently, it is believed that across Northern Ireland all diarrhoeal stool samples submitted to hospital laboratories are routinely tested for *E. coli* O157, as recommended in the Scottish Taskforce report prepared by ACMSF and the Pennington Group.

The Scottish Taskforce report recommends the use of immunomagnetic separation technique (IMS) in a variety of circumstances (paragraph 4.24). Within Northern Ireland this would be difficult for the laboratory staff, as they would require extra clinical information to determine which samples required IMS and it would also prove costly in terms of providing the test. The Northern Ireland Taskforce therefore recommends adopting the HPA guidelines (www.hpa.org.uk/cdph/issues/CDPHvol3/No1/vtec.pdf) of March 2000 which suggest examining all faecal specimens for *E. coli* O157 by inoculation on Sorbitol McConkey Agar (SMAC). For outbreak situations or when advised by a senior microbiologist/scientist the Taskforce then recommends an enrichment stage using modified Tryptone Soya Broth.

NIPHL currently uses the IMS technique to examine foods from outbreaks (the numbers of *E. coli* O157 in food samples are much smaller than in faecal samples). IMS is therefore available upon request for non-outbreak food samples and human faecal samples if necessary.

Following a positive result, all isolates from human sources or food are sent to the Centre for Infections, Colindale for phage typing and toxin testing. In addition, the Belfast City Hospital laboratory has a molecular test for toxins, which can identify toxigenic strains more quickly than the result would be available from the Centre for Infections. Samples should be sent from other laboratories within Northern Ireland for this test.

Recommendations 9-11

9. All human faecal samples should be examined for presumptive *E. coli* O157 by inoculation on SMAC.

10. For outbreaks, or when advised, laboratories should use an enrichment stage using modified Tryptone Soya Broth.

11. All human isolates should be sent both to the BCH for toxin testing and the Centre for Infections, Colindale for phage typing and confirmatory toxin testing.

3.3 Public health management of cases and outbreaks

The HPA 'Guidelines for the control of infection with Verocytotoxin producing *Escherichia coli* (VTEC)'[26] contain recommendations for managing a single case of VTEC and how to prevent person-to-person spread

The guidelines at www.hpa.org.uk/cdph/issues/CDPHvol3/No1/vtec.pdf provide general advice for institutions on hand-washing, provision and cleaning of toilet facilities and also specific recommendations to prevent spread within nursing and residential homes. They also address exclusion from work or school for certain high risk groups (see table below) and their close contacts, and how to manage an outbreak in an institution.

Groups that pose a special risk of spreading infection

1. Food handlers whose work involves touching unwrapped foods to be consumed raw or without further cooking.
2. Health care, pre-school nursery or other staff who have direct contact, or contact through serving food, with highly susceptible patients or people in whom an intestinal infection would have particularly serious consequences.
3. Children under 5 years of age attending nurseries, playgroups or other similar groups.
4. Older children and adults who are unable to implement good standards of personnel hygiene - for example those with learning disabilities or special needs; and people in circumstances where hygiene arrangements may be unreliable - for example temporary camps housing displaced persons. Under exceptional circumstances children in infant schools may be considered to fall into this group.[26]

Recommendation 12

12. Sporadic human cases and outbreaks of *E. coli* O157 should be managed in accordance with the HPA guidelines.

CHAPTER 4

Prevention and Control

The aim of this strategy is to reduce the incidence of human *E. coli* O157 infection by reducing exposure to the organism and educating the public on how to minimise the risk of transmission. Human infection results from exposure to *E. coli* O157 and prevention is considered under the headings:

- Preventing contamination of water supplies
- Direct contact with animals and their faeces
- Recreational use of animal pasture
- The food chain
- Person-to-person spread

This chapter outlines the processes that are currently in operation to reduce the rates of infection and also highlights some areas that may require further action.

4.1 Preventing contamination of water supplies

The water supply can be contaminated either from direct faecal contamination by animals or from run off from agricultural land either after slurry spreading or from grazing land after a heavy rainfall.

Legislation and measures set the standards for drinking water in public supplies. The Water Service is responsible for implementing the requirements of the regulations. The Drinking Water Inspectorate (DWI) has an independent responsibility to assess and regulate compliance against these standards.

Monitoring of public water supplies

The public water supply is tested regularly for coliform bacteria. Tests are routinely carried out for total coliforms and *E. coli*. Tests are not routinely carried out for *E. coli* O157. *E. coli* is a very sensitive indicator of contamination and follow up testing for *E. coli* O157 would only be considered in extreme instances/outbreak situations.

The frequency of testing depends on the population in each testing zone but is generally weekly. A positive sample leads to the test being repeated and the sampling extended. The CCDC is also notified and a boil water notice may be issued if the CCDC feels it is appropriate. A standardised boil water notice is used across Northern Ireland.

There are very few reports of coliform or *E. coli* being detected in the public water supply and in these instances the numbers of organisms are very low (*E. coli* is very susceptible to chlorine).

Monitoring and treatment of private water supplies

Legislation also sets the standards for private water supplies. It applies to private supplies which serve more than one household for purely domestic purposes, or are used in commercial food production.

Private water supplies are classified according to size and use and monitoring requirements are based on these classifications. There are very few domestic supplies serving more than one property (See the DWI 2003 annual report for more information, accessible at www.ehsni.gov.uk/environment/drinkWater/drinkWater.shtml).

The DWI is responsible for implementing the regulations regarding private water supplies. Monitoring and any follow-up action is carried out in co-operation with District Councils, except for dairy farms where there is co-operation with DARD. Results of sampling are copied to owners and District Councils and advice/remedial measures given to owners from DWI and District Councils.

An information leaflet (produced by DWI and at ehsni.gov.uk/pdf/PrivateWater.pdf) is available to all private water supply owners through District Councils

The owners of these private water supplies are also advised to boil their water and advise guests accordingly after an unsatisfactory sample. A formal notice is not usually issued. Business and commercial premises mainly comply with the advice and have the option to change to mains water supplies for short periods if necessary.

Single household private water supplies

Private water supplies for single households are not covered by the current regulations and will not be covered by the new regulations. There will be no duty to sample these supplies but as, at present, District Councils will currently test these supplies and give information **on request from the house owner**. In addition, Councils will have the means under proposed new regulations to carry out risk assessments at their discretion on single household supplies. In the case of new dwellings which will be dependent upon a private water supply, there is a requirement that plans submitted to councils for approval should be rejected unless the applicant shows evidence that the property will have an adequate and wholesome water supply.

4.2 Direct contact with animals and their faeces

Exposure to animals and their faeces can occur in a variety of occupational settings, such as farms or vets working with live animals or abattoir workers who handle carcasses. In addition family members who live on farms, particularly children, may be at increased risk of exposure from direct contact with animals or their faeces.

Farmers and their families, vets and abattoir workers need to be aware that *E. coli* O157 can cause serious illness. Simple control measures such as washing hands after contact with animals or animal faeces are important and can be very effective. Children need to be supervised to ensure that this is carried out and farm visitors also need to be made aware of the importance of hand-washing.

Farmers also have a responsibility to ensure that their stock is produced/reared under appropriate conditions and presented to abattoirs in a clean condition.

Appropriate management of slurry and manure on farms is necessary to avoid contamination of food and water. Raw manure or slurry should not be spread near a crop which is to be eaten raw e.g. fruit or vegetables. The FSA is currently developing guidance, 'Managing Manures for Food Safety'. A final draft expected to go out for consultation in the near future.

Open farms allow the public to access animals in a farm setting. These are popular for school visits, particularly for young children. They represent an area where exposure to *E. coli* O157 may occur in a vulnerable group. Owners and visitors must be aware of this and know what actions to take to minimise the risk.

Current initiatives to address these issues are outlined below.

Farms

Education and promotion of awareness of risk amongst farmers and their families

Inspectors from HSENI inform farmers of the risk to health from relevant zoonoses including *E. coli* O157, where appropriate. Hygiene practices in the context of preventing zoonoses are raised opportunistically by the Health and Safety Executive Northern Ireland (HSENI) during random farm inspections and at safety awareness days (held throughout Northern Ireland for farmers). Advice given on these occasions would be generic to zoonoses rather than specific to *E. coli* O157. Control of Substances Hazardous to Health regulations (COSHH) apply to self-employed farmers and to all workplaces.

HSENI and the Health and Safety Executive (HSE) have information for farmers:

- HSENI's *Guide to Health and Safety in Agriculture* is distributed at inspections, awareness days, shows and available at www.hseni.gov.uk/InfoAndGuide/guide to agriculture.pdf but is not routinely distributed to all farms. This booklet does not, however, refer to food-borne illnesses, risks associated with consumption of unpasteurised milk or common illnesses of concern such as TB, salmonella, brucellosis or *E. coli* O157.

- A leaflet is available from the HSE website detailing common zoonoses in agriculture. This contains some specific control measures for *E. coli* O157

(*Agriculture Information Sheet No. 2 – Common Zoonoses in Agriculture* - www.hse.gov.uk/pubns/ais2.pdf).

In 2003, the Advisory Committee on Dangerous Pathogens launched its guidelines on infection control in the workplace www.hse.gov.uk/pubns/infection.pdf. This refers to the need for good hygiene practices, describes best practice in hand-washing and gives advice on work clothing and HUS. There are also worked examples of risk assessments.

Work carried out recently on brucellosis will also contribute to increased awareness amongst farmers of control measures.

- A flyer regarding brucellosis was distributed to all farms with breeding cattle in Northern Ireland. An accompanying booklet targeted owners of positive herds. Both highlighted good hygiene practice and the latter emphasised the risks associated with consumption of unpasteurised milk.

- DARD has run disease prevention campaigns for farmers regarding brucellosis in recent years.

If disease is detected in animals, DARD will advise farmers on the action required.

In summary, whilst there are a number of generic publications for farmers, parts of which deal with zoonosis, information on *E. coli* O157 is limited. Other recent campaigns, such as that dealing with brucellosis, will have helped to raise awareness of good practices on farms

It is however important that *E. coli* O157 is emphasised within these types of publications and that the risk to the farmer's family (particularly children and elderly) and visitors from contact with animals and their faeces and simple control measures are highlighted.

Ensuring good husbandry practices

DARD ran an extensive campaign in 2002 in Northern Ireland to train farmers regarding good husbandry practices and the cleanliness of cattle necessary for slaughter. An HSE guide entitled 'Preparing cattle for slaughter' is available for farmers at www.hse.gov.uk/pubns/ais34.pdf.

The correct handling of slurry and manure

DARD produces codes of practice for the prevention of pollution of water, air and soil. They, and additional advice, are available from Countryside Management staff located in the local county agricultural offices and development centres or from Annex D, Dundonald House, Belfast:

- *Code of Good Agricultural Practice for Prevention of Pollution of Air and Soil*
- *Code of Good Agricultural Practice for the Prevention of Pollution of Water.*

Open farms

There are approximately twelve open farms within Northern Ireland, with the majority of visits being to four or five of these. Although there is no legal requirement for open farms to be registered, HSENI retains a database of open farms. In addition open farms within Northern Ireland tend to belong to an "open farm" group, which is facilitated by the Ulster Farmers Union.

Risk assessment and management of animals and facilities on open farms

COSHH regulations require that owners of open farms carry out a risk assessment of all substances hazardous to health including biological agents.

Guidance was produced by the HSE in 2002 (*Agriculture Information Sheet No. 23 – Avoiding ill health at open farms – Advice for farmers (with teachers' supplement*) and was circulated to all open farms in Northern Ireland. This guidance is available at www.hse.gov.uk/pubns/ais23.pdf.

The following topics are covered in the guidance:

- assessing and controlling the risk
- farm layout and routes
- animal contact
- eating areas
- washing facilities
- information and signs
- training and supervision of staff
- livestock management
- manure and compost heaps.

In addition to the open farms that fall to HSENI for enforcement of health and safety legislation, District Council environmental health staff have enforcement powers in respect of health and safety in a range of premises that may be co-located with farms but would be separately categorised as holiday accommodation or leisure facilities. These premises are visited by EHOs at a frequency dictated by the perceived risk, and guidance and advice is given to business operators

HSENI has a role in ensuring this guidance is being implemented and compliance is assessed every few years. To date its inspectors report good practice in operation. HSENI inspectors have also spoken to the "open farm group" (Ulster Farmers Union) to highlight the importance of the guidance.

DARD Veterinary Service has a heightened awareness regarding reports of disease in animals from open farms and would follow these cases up promptly with subsequent advice to owners and, if necessary, liaise with HSENI.

Guidance for schools planning visits to open farms

The guidance mentioned above, available on the HSE website at www.hse.gov.uk/pubns/ais23.pdf, has a supplement which advises teachers on the risks, measures they should take to minimise the risk, and suitable ratios of pupils to teachers in relation to visits to open farms.

A video clip is also available from the HSE website entitled *Open farms - healthy children* (www.hse.gov.uk/campaigns/killfields/ecoli.htm). This can be used for schools prior to a visit to an open farm and focuses on the importance of hand-washing. HSENI inspectors also supply a copy during their visits to open farms.

***safe*food**, the Food Safety Promotion Board has produced a leaflet 'Staying safe down on the farm'. This leaflet is available is available on the ***safe*food** website (www.safefoodonline.com) or via the ***safe*food** helpline on 0800 085 1683 (NI) or 1850 40 4567 (ROI).

The Scottish Executive has produced a package for schools containing information on visits to open farms and the recreational use of animal pasture.

4.3 Recreational exposure

E. coli O157 can be spread to humans via direct contact with animals and indirectly via faeces and manure spread on land. It is important that land owners and those who make recreational use of animal pasture are aware of the potential risks and measures which should be taken to minimise the risk of exposure.

Current initiatives to address this are outlined below:

Education and awareness for land owners

The information available for land owners is minimal. HSE issues a general press release detailing guidance on the use of farmland for recreation and precautions needed to reduce the risk of infection. This is available on the HSE website at www.hse.gov.uk/press/2004/e04046.htm.

Some categories of landowners may operate businesses such as touring caravan sites or camping sites on land that is at other times used for pasture. Some, but not all, of these businesses are subject to District Council licensing regimes under which requirements for removal of animals from the land a specified period before use as a camping site would be conveyed.

Similar recommendations would be provided to landowners operating seasonal leisure pursuits on land otherwise used for pasture where these businesses fall to District Council enforcement of health and safety legislation.

Education and awareness for members of the public

No information appears to be available within Northern Ireland to raise awareness amongst members of the public or amongst specific vulnerable groups (e.g. scouts) of the risks from camping on land which has recently been used by animals or about measures to take to minimise the risk.

The Scottish Executive has produced a leaflet "Recreational Use of Animal Pasture" which was distributed to a wide range of organisations across Scotland with an interest in outdoor activity. There is potential to adapt this for use in Northern Ireland.

4.4 Preventing contamination of the food chain

Contaminated raw food, poor hygiene and cross contamination are significant factors in contamination of the food chain with *E. coli* O157. The presence of *E. coli* O157 on or in raw foods is not visible to the naked eye and it does not cause obvious food spoilage. Therefore, it is important that at all parts of the food chain (from farm to fork) owners, staff and consumers are aware of these issues and that strategies are in place to minimise the risk.

Current legislation and practices to address these issues are outlined below.

Abattoirs

Management of cattle and sheep within abattoirs

A clean livestock policy, for cattle and sheep being brought to the abattoir, was introduced in Northern Ireland in 1997. It ensures a consistent approach to the categorisation of animals presented for slaughter and ensures that only animals considered to be clean and dry are slaughtered for human consumption. DARD undertook an extensive campaign when the clean livestock policy was introduced, to advise farmers about the appropriate cleanliness of animals presented for slaughter, and now enforces this policy on behalf of the FSA. Guidance has been produced by the FSA and can be accessed from their website: 'Clean Beef Cattle for slaughter, A guide for producers' at www.food.gov.uk/multimedia/pdfs/cleanbeefsaf.pdf and 'Red Meat Safety and Clean Livestock' at www.food.gov.uk/multimedia/pdfs/redmeatsafety.pdf .

All abattoirs must conduct regular checks on the general hygiene of conditions of production based on Hazard Analysis and Critical Control Point (HACCP) principles. This is a legislative requirement introduced by the Meat (Hazard Analysis and Critical Control Point) Regulations (Northern Ireland) 2002. This requirement extends to all licensed red meat and poultry meat abattoirs, cutting plants, cold stores, re-packaging plants and re-wrapping centres. The legislation applied from July 2002 for large meat establishments and from June 2003 for small meat establishments. The FSA undertook training in HACCP for large and small meat establishments in 2002 and 2003, with workshops for plant employees throughout the UK. All licensed meat premises also

received a training pack containing the FSA Meat Plant HACCP manual and CD-ROM. DARD Veterinary Service enforces these regulations in Northern Ireland on behalf of the FSA and reviews their implementation on an annual basis.

The storage and removal of blood at abattoirs is covered by the Animal By-Products Regulations (Northern Ireland) 2003 which came into operation on 3 December 2003 and cover the treatment of blood before final disposal.

Butchers' shops

As a result of the Pennington Report, the licensing of butchers' shops was implemented across the UK. The governing legislation in Northern Ireland is the Food Safety (General Food Hygiene) (Amendment) Regulations (Northern Ireland) 2001. This came into operation on 16 April 2001 amending the Food Safety (General Food Hygiene) Regulations (Northern Ireland) 1995.

A "butcher's shop" is defined as a food premises engaged in the handling of unwrapped raw meat and the sale of raw meat, either wrapped or unwrapped, together with ready to eat foods.

Whilst the determining factor for a licence is the handling and sale of open raw meat and ready to eat foods, all food products sold from a licensed butcher's shop are covered by licensing conditions and would need to be addressed in the shop's food safety management arrangements and HACCP plan. This would include uncooked meat products and meat preparations, such as sausages and burgers, although such products have not been included in the definition of "raw meat". However premises such as delicatessens and grocers that may sell only uncooked meat products and preparations and ready to eat foods (but not raw meat) will not require a licence. These types of premise are covered by other provisions in the Food Safety (General Food Hygiene) Regulations (Northern Ireland) 1995 and within these are required to control the cross contamination risks from any raw foods to cooked products.

Licences are granted by District Councils and the butchers' licensing regulations give the appropriate District Council the discretionary power to suspend or revoke a licence of premises that do not satisfy the licensing conditions.

In addition, the butchers' licensing regulations require that all supervisors of persons handling meat working in the butcher's shop must have received a level of training to at least the standard of the Chartered Institute of Environmental Health (CIEH) Intermediate Food Hygiene Certificate Course or the RSH Certificate in Food Hygiene Management. Supervisors must be able to supervise the food activities in the business and the operation of the HACCP system. It is the responsibility of the manager to determine which staff require training. Information on training courses is available on the FSA website.

In addition, all staff handling meat in a butcher's shop must also have received a level of training in food hygiene to at least the equivalent of the CIEH Basic Food Hygiene

Certificate or the Certificate in Essential Food Hygiene of the Royal Society for the Promotion of Health. It is the responsibility of the management to ensure that training is made available to staff.

An evaluation of the effectiveness of licensing of butchers' shops was carried out in Scotland at the suggestion of the Scottish Taskforce. The main findings showed that food safety standards in butchers' shops had improved since the *E. coli* O157 outbreak in Scotland however the general belief was that this was not solely due to the licensing scheme as local authorities had also undertaken measures to improve standards.

It is anticipated that licensing of butchers' shops will no longer be required from 1 January 2006 with the introduction of new EU regulations. These regulations will set equivalent standards to those currently required under licensing.

Food processing, distribution, retail, catering

District Councils via EHOs have responsibility at the point where food enters a manufacturing premises or a distribution network and retain control until sale to the final consumer.

Ensuring food safety management within the workplace including education and awareness

Risk management by the business operator is at the heart of the modern approach to ensuring food safety. HACCP systems are mandatory requirements for food businesses that are subject to specific legislation such as those manufacturing, packing, handling and transporting meat, fish or dairy products. Butchers selling fresh meat as well as other foods require licences to operate that are dependent upon the operation of both a HACCP system and adequate staff training (as above). Similar management systems involving HACCP principles are required, albeit without full documentation, of every food business

HACCP principles have been fully incorporated into the current text of EU food hygiene legislation due to apply from 1 January 2006. This new legislation (three sets of regulations and two directives) will consolidate and simplify seventeen existing food related directives.

EHOs regularly inspect food premises. The frequency of inspection is decided by the EHO upon assessment of the risk the business poses. Consideration is given as to whether the business trades with a small or large customer base; whether that customer base is local, regional or national; whether the customers are likely to be within the susceptible groups for *E. coli* O157; and whether the foods handled are of a type more or less likely to present a risk to food safety.

During visits, EHOs are expected to gain a comprehensive view of the food safety standards maintained and seek to ensure that managers and staff understand the possible hazards that the foods they handle could create for consumers, have a clear grasp of the

risks that their particular business may actually pose and have the knowledge and capacity to control those risks to an acceptable level.

Where inspecting officers identify food safety risks, they operate a hierarchy of measures from provision of advice to formal letters, legal notices requiring action, and instigation of legal proceedings. Where significant risks are posed to the public by the condition or operation of a business, it may be closed immediately.

In addition to a programme of inspections, EHOs will undertake sampling of foods within the food chain to determine their microbiological fitness. Sampling programmes are co-ordinated across Northern Ireland by the Northern Ireland Food Liaison Group and frequently link with regional or national sampling surveys. Unsatisfactory results are followed up and may result in a review of food handling practices or could even result in product recall and formal action being taken against a business.

There is a legislative requirement that new businesses register with District Councils four weeks prior to opening. This is based upon the premise that this will allow environmental health staff to advise and assist the new business before opening to ensure that standards are met when it does open.

There is also a general requirement for all food businesses to ensure that food handlers are supervised, instructed and/or trained so as to enable the safe preparation and handling of food.

In addition to the activities mentioned above, District Councils also provide incentives to caterers to meet high standards by the implementation of a food safety award scheme across Northern Ireland. The 'Eat Safe' award requires the adoption of full HACCP systems and good standards of compliance with legal requirements and an adequate level of food hygiene training. It is hoped that this initiative will promote interest among both food businesses and the public thus promoting increased safety standards.

EHOs also provide advice, assistance and education to businesses. There is a wide range of advice leaflets, booklets etc available. Some are professionally produced while many District Councils produce their own guidance for businesses. An EHO will visit businesses on request and educational initiatives may be promoted on a local or regional basis. Activities in addition to inspections and despatch or provision of direct advice may include the organisation of seminars, training and briefing sessions.

The FSA website also contains comprehensive advice to caterers to help reduce food poisoning.

Training for the food industry

For businesses themselves, there are courses/night classes available at local colleges in food safety and HACCP.

Importantly, it is the responsibility of the individual business to train staff although, as stated above, EHOs offer advice and documentation.

Labelling of food products

Beef

New compulsory regulations on beef labels began on 1 September 2000 as part of a European Union wide system.

These regulations are designed to provide buyers with clear, reliable information about beef (including veal) on sale and to ensure that beef on sale can be traced back to where it originated.

The rules apply to all fresh and frozen beef and veal (and these meats when minced or in uncooked beef burger patty) at all stages in the production chain from slaughter house to retail counter.

Beef sold to the final customer in the form of processed products e.g. sausages, beef burgers, pies, ready-meals or canned beef is not subject to these rules.

Pre-wrapped meat must be labelled on its packaging. Non pre-wrapped meat sold to the end customer must have information on the meat or displayed in the shop.

Labels must contain the country of origin, the country/countries of rearing (Northern Ireland is included within UK), the approved plant number of the slaughterhouse and where the meat was cut. This will all enable traceability and recall. Any other labelling claims such as origin, characteristics or production methods require approval under the beef-labelling scheme.

Specialist cheese makers

Specialist cheese makers are small-scale producers. Their products are often produced on small farms in the traditional way, using open vats and are hand stirred, bandaged and waxed. About 75% of specialist cheese products are made with unpasteurised milk. They have been implicated in some *E. coli* outbreaks and are mentioned in the Scottish Taskforce Report.

The Scottish Taskforce recommended that there should be a suitable method of traceability for small cheese producers.

Within Northern Ireland, cheese manufacturers operate under the Dairy Products (Hygiene) Regulations (Northern Ireland) 1995 as amended, and should maintain records sufficient to enable product recalls. Traceability will operate to retail level.

There are a few specialist cheese makers within Northern Ireland but to date all use pasteurised milk.

Safe production of milk

Dairy farms are licensed and inspected by DARD Quality Assurance Branch (QAB) on behalf of the FSA.

DARD QAB also inspect milk pasteurisation plants. These plants must monitor pasteurisation effectiveness. They are required to have flow diversion valves that monitor the time/temperature the milk is held at and can divert the milk back for re-processing where necessary.

Currently there is no sale of unpasteurised milk to shops within Northern Ireland.

However there is a legal provision for untreated milk to be sold via farm gate sales or doorstep deliveries. Farm gate sales may include the provision of untreated milk in the catering sale to bed and breakfast guests resident on a dairy farm or via tearooms on open farms. These sales must be conducted under a clear message that informs customers that milk sold is untreated and may be harmful to health. To date the sale of milk in this manner does not seem to be a particular problem within Northern Ireland.

Farms which produce sheep and goats' milk must be licensed and inspected by DARD in the same way as other dairy farms. Currently there are approximately 13 licensed producers within Northern Ireland. The majority supply to a processor. One, a sheep milk producer, is approved to heat treat, making ice cream and yoghurts.

There remains however the possibility that unpasteurised milk (cow/sheep or goat) may be used on farms for personal use by the farmer, his/her family or visitors and the risks associated with this should be highlighted to farmers.

***safe*food**, the Food Safety Promotion Board, has developed a factsheet on unpasteurised milk, which indicates the potential risks associated with drinking unpasteurised milk (www.shb.ie/content-972354915_1.cfm). This leaflet is available via the ***safe*food** helpline.

Exclusion of staff with VTEC from the workplace

The HPA guidelines identify four risk groups one of which is food handlers;

Groups that pose a special risk of spreading infection *1. Food handlers whose work involves touching unwrapped foods to be consumed raw or without further cooking.*

2. Health care, pre-school nursery or other staff who have direct contact, or contact through serving food, with highly susceptible patients or people in whom an intestinal infection would have particularly serious consequences.
3. Children under 5 years of age attending nurseries, playgroups or other similar groups.
4. Older children and adults who are unable to implement good standards of personnel hygiene - for example those with learning disabilities or special needs; and people in circumstances where hygiene arrangements may be unreliable - for example temporary camps housing displaced persons. Under exceptional circumstances children in infant schools may be considered to fall into this group.[26]

To prevent potential contamination of the food chain staff with *E. coli* O157 infection who meet the above criteria must have microbiological clearance (2 negative faecal specimens taken at intervals of not less than 48 hours) before returning to work. Contacts of these workers will also be screened microbiologically

Consumers

Education and awareness to consumers on good practice in handling food

Consumers have an important role to play in food safety. There are a number of resources available to the public from the FSA website which contains general information on food hygiene issues including keeping food safe in the kitchen, summer eating and eating out. There are also leaflets available to download.

In addition, ***safe*food**, the Food Safety Promotion Board undertakes education and awareness campaigns on food safety and hygiene using television, radio and posters and has a website with advice for consumers.

District Council environmental health staff provide advice to consumers on food handling practices in an annual Food Safety Week and also via seasonally topical press releases and leaflets. Environmental health staff are involved in training the community-based leaders of the 'Cook-it' programme aimed at increasing the skills of mothers with young children will also be involved in the 'Fit 4 Play' initiative.

Whilst many companies also display clear cooking instructions on products, this is not a legislative requirement.

Resources for teachers

Teaching good practice regarding the handling and preparation of foods in schools in important. To support this, FSA has produced a resource called Food Hygiene Mission Control which is an interactive resource for children aged 7 to 14 and their teachers to educate young people on food hygiene issues. This can be downloaded from the FSA website at www.food.gov.uk/northernireland.

***safe*food**, the Food Safety Promotion Board has also produced teaching resources for primary and secondary school teachers which are available from its website. (www.safefoodonline.com)

Secondary schools cover food safety and hygiene as part of food technology which is a compulsory part of the National Curriculum up to Key Stage 4 and would utilise the information on the FSA and FSPB website to develop this section of the curriculum.

4.5 Person-to-person spread

Person-to-person spread is a real risk because of the low infectious dose of *E. coli* O157, however good personal hygiene will minimise person-to-person spread. This is considered here under two main areas – individual cases and settings where there are particularly vulnerable groups, such as children or elderly.

Individual cases

Whenever an individual case of *E. coli* O157 is notified to HSSBs, the Board takes on responsibility to ensure that the case and close contacts are aware of the appropriate precautions to take e.g. good hygiene. The Board also identifies any cases and contacts who fall into one of the risk groups identified in the HPA guidelines (see below) and advice on appropriate exclusions from work/school.

Groups that pose a special risk of spreading infection

1. Food handlers whose work involves touching unwrapped foods to be consumed raw or without further cooking.
2. Health care, pre-school nursery or other staff who have direct contact, or contact through serving food, with highly susceptible patients or people in whom an intestinal infection would have particularly serious consequences.
3. Children under 5 years of age attending nurseries, playgroups or other similar groups.
4. Older children and adults who are unable to implement good standards of personnel hygiene - for example those with learning disabilities or special needs; and people in circumstances where hygiene arrangements may be unreliable - for example temporary camps housing displaced persons. Under exceptional circumstances children in infant schools may be considered to fall into this group.[26]

Cases in the above risk groups require microbiological clearance (two negative faecal specimens taken at intervals of not less than 48 hours) before returning to work/school. In addition contacts in the risk groups are screened microbiologically and those contacts in risk groups 3 and 4 need microbiological clearance before returning to work.

Institutions

Safe food handling within institutions

Institutions often contain groups who are particularly vulnerable to infection from *E. coli* O157 e.g. children/elderly. It is thus important that staff within these settings are aware of the risk posed by *E. coli* O157 and appropriate measures to minimise this risk.

EHOs will require a level of training within any food business that is commensurate with the risks inherent within the operation. In a business catering for susceptible groups such as the elderly or the very young, higher standards of competence may be expected. Guidance on the level of competence can be obtained from the 'Industry Guide to Good Catering Practice' (ISBN 0113218990). Basic food hygiene certificates are required to work in the kitchens of nursing and residential homes, day care centres and children's homes. The Regulation and Improvement Authority (formerly Registration and Inspection units) advise that all other staff who handle food have awareness training relative to their activities every year.

Food hygiene training is also required for kitchen staff within schools and boarding schools.

Initiatives such as HACCP training were undertaken by most local authorities, in relation to businesses catering for susceptible groups, in 1997. These businesses are still clearly identifiable on databases and will receive more frequent inspections.

Guidance/advice on good hygiene practices and how to reduce cross infection

EHOs have statutory responsibility for the enforcement of food safety legislation in all premises within this category, and with HSENI share responsibility for health and safety enforcement (including ensuring adequate control by management of biological risks). In the event of a case or outbreak of *E. coli* O157 in an institution, EHOs will undertake the investigation to determine the source of infection and to reduce the risk of spread on behalf of the relevant HSSB and will use their own powers to ensure that food safety standards are adequate to minimise risk.

Care homes

The Regulation and Improvement Authority responsibility for residential and nursing homes, independent hospitals, speciality clinics (e.g. private, infertility), children's homes and boarding schools. New regulations and standards are currently being developed within DHSSPS. This will expand their remit to cover day care centres. It should be noted that from 1 April 2005 the responsibility for the registration and inspection of all homes has transferred to the Health and Personal Social Services Regulation and Improvement Authority or RQIA.

Regulation 11(1)(t) of the Nursing Home Regulations (Northern Ireland) 1993 requires the provision of "adequate arrangements for the prevention of infection, toxic conditions or spread of infection at the home".

The 1995 Children's Order which covers special needs homes (can have up to 8 residents) does not specifically mention infection control regulations, however these homes tend to follow the general advice given to residential homes.

Guidelines on the 'Control of Infection in Residential and Nursing Homes' from the Public Health Medicine Environmental Group were sent to all care homes in Northern Ireland (including children's homes and boarding schools) at the time of publication (1996). This guide includes universal infection control procedures, cleaning and disinfection, food hygiene, laundry, personal hygiene, specimens and waste. There is also a section on advice for managing residents with diarrhoea and vomiting.

The Public Health Departments within the four HSSBs also provide advice to care homes during any updates on communicable disease control issues and on an ad hoc basis via telephone queries.

Schools

All schools within Northern Ireland were re-issued with the 'Exclusion from school due to infectious disease' posters in 2003. This included primary and secondary schools and playgroups and nurseries. Schools and nurseries are also advised that any child suffering from an infectious disease should be kept at home until well.

HSSBs meet with school nurses and clinical medical officers on a regular basis giving a forum for any issues to be addressed.

In the event of a case notified in a school, information leaflets are provided to the school and control measures strengthened including contact tracing, checking of high risk status and voluntary or compulsory exclusion where necessary.

To prevent cross infection of gastrointestinal infections, including *E. coli* O157 it is essential that all schools have adequate hygiene facilities.

The scale of provision of sanitary facilities in schools is laid down in legislation, however the observed failures that lead to cross infection can be those of management of the facilities. These may include limited supervision of sanitary facilities, inadequate cleaning resources to cope with incidents occurring during the day, and occasional inadequacies in supply of paper towels etc. Advice and guidance may be given to schools by Education and Library Boards.

Problems with this were observed in an outbreak of *E. coli* O157 within two schools in the Eastern HSSB in 2001[27]. Faults noted were problems with water pressure and the

warm water supply to the toilet/hand-washing area and the unacceptable practice of pupils post-toilet use returning to class prior to washing/drying their hands (paper towels were only available in the class room due to previous problems with vandalism).

The Department of Education currently pays grant aid for the refurbishment of toilets in the schools' estate. In the past, circulars have been issued to schools regarding health and safety risks. However there has not been specific activity targeting this area. Although improvements have been made over the last five years in schools toilets, it is accepted that consideration now needs to be given to a programme of works to bring them all up to a satisfactory standard.

The Department's Building Branch is working with its technical advisors to develop an action plan. It is not yet known if funding will be made available to carry out this work. In the meantime, requests for improvements are being progressed as quickly as possible and with a view to ensuring additional work to bring the toilet facilities up to a good standard.

The *BOG Standard* campaign was launched in Northern Ireland on 27 September 2005. Its work is to be supported and encouraged especially where it sets out clearly what is required to bring toilet facilities up to standard. The campaign makes suggestions for good toilet design and identifies and discusses a range of issues:

Options to remove the risk of transmission of disease with taps
Service pipes should be hidden where possible
Replacement of radiators
Ratio of hand towels/dryers
Fresh floor concept at urinals
All drinking fountains should be removed from toilets and replaced, out in circulating areas, with chilled/filtered water dispensers
Removal of existing hose reels after fire risk assessment
Examination of options for entrances to toilets
Good ventilation is a must.

Recommendation 23

All schools (including pre-schools, crèches and daycare centres) should have adequate hygiene facilities in terms of scale of provision to meet relevant statutory standards. It is also important that management arrangements ensure that cleaning regimes and the provision of hygiene materials are sufficient to minimise cross infection risks.

4.6 Education, advice and raising awareness recommendations: 13-24

On reviewing the work which is currently being undertaken to reduce the incidence of human *E. coli* O157 infection within Northern Ireland it was evident that whilst there was a large amount of work already occurring, a number of areas would benefit from

strengthening, particularly in relation to education and raising awareness. In light of this the following recommendations are made:

13 It is recommended that owners of single household private water supplies be advised that their water supplies should be microbiologically tested.

14 It is recommended that animals and animal slurry and manure must be managed in a manner that does not contaminate wells and other water supplies. Guidance is needed for the farming community on maintenance of safe water supplies.

15 It is strongly advised that no one consumes unpasteurised milk. Farming families and visitors to farms are advised to either buy pasteurised milk for home consumption or to pasteurise their own milk with a reliable home pasteuriser.

16 The current programme of education and reinforcement of messages concerning good personal hygiene and safe food handling practices for food businesses and consumers should be maintained. This type of advice should be easily accessible.

17. All open farms and related activities presenting similar risks should receive information/advice every two years (or sooner if updated/revised guidance becomes available) on minimising the risk to staff and visitors from *E. coli* O157.

18. All schools should receive information/advice every two years (or sooner if updated/revised guidance becomes available) regarding the risks posed by visits to open farms and appropriate precautionary measures to minimise the risk of *E. coli* O157 infection.

19. Farmers and farm families should receive information/advice every two years (or sooner if updated/revised guidance becomes available) on the risks of *E. coli* O157 and appropriate precautionary measures to minimise their risk of infection. This should be included as part of a generic programme on infection risks on farms.

20. Specific advice on *E. coli* O157 should be included in formal training on zoonoses for agricultural trainees at the College of Agriculture, Food and Rural Enterprises (CAFRE) at Greenmount campus.

21. All farmers should receive information/advice every two years (or sooner if updated/revised guidance becomes available) on the correct management of slurry and manure including its use in fruit and vegetable production.

22 All institutions within the community, including residential and nursing homes, crèches, schools and daycare centres, should have access to community infection control advice.

23 All schools (including pre-schools, crèches and daycare centres) should have adequate hygiene facilities in terms of scale of provision to meet relevant statutory standards. It is also important that management arrangements ensure that cleaning regimes and the provision of hygiene materials is sufficient to minimise cross infection risks.

24 Where the use of land by the public, or by organised groups falls within a definition of business use, relevant enforcing authorities should seek to ensure that landowners are made aware of their responsibilities to undertake and act upon the outcomes of risk assessments for biological risks. Sports governing bodies and those bodies directing the activity of youth organisations that may access land otherwise used as animal pasture should ensure the availability and dissemination of advice and precautions to be taken to minimise the risk of infection from *E. coli* O157.

Appendix

Membership of the Northern Ireland *E. coli* O157 Taskforce

Dr George McIlroy (Taskforce chair, Chief Scientific Officer, DARD)

Ms Barbara Cooper (Divisional Veterinary Officer, DARD)
Dr Elizabeth Davies (Consultant Microbiologist, Causeway Hospital, Coleraine)
Dr Michael Devine (Consultant in Communicable Disease Control, NHSSB)
Dr Lorraine Doherty (Senior Medical Officer, DHSSPS)
Mr Jeffrey Dudgeon (Taskforce Secretary, Health Protection Team, DHSSPS)
Dr Kirsten Dunbar (Principal Veterinary Officer, FSA, Belfast)
Mr Barny Heywood (Group Chief Environmental Health Officer, Omagh)
Dr Angela Jordan (Specialist Registrar/DHSSPS)
Professor David McDowell (Food Microbiology Research Group, University of Ulster)
Mr Stanley McDowell (Veterinary Research Officer, VSD, DARD)
Mr Nigel McMahon (Chief Environmental Health Officer, DHSSPS)
Dr Thomas Quigley (Science & Technical Director, ***safe*food**, the Food Safety Promotion Board, Cork)
Dr Paul Rooney (Consultant Microbiologist, NIPHL)
Dr Brian Smyth (Director, Communicable Disease Surveillance Centre, BCH, Regional Epidemiologist).

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Produced by:
Department of Health, Social Services and Public Safety,
Castle Buildings, Belfast BT4 3SQ

Telephone (028) 9052 2059

Textphone: (028) 9052 7668

email: health.protection@dhsspsni.gov.uk

www.dhsspsni.gov.uk

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