



Epidemiology of Verotoxigenic *E. coli* O157 in Ireland, 2002

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Introduction

Verotoxigenic *E. coli* (VTEC) are so-called because of their ability to produce one or both of two verotoxins (VT1 and VT2). They cause a wide range of illnesses, from mild diarrhoea to haemorrhagic colitis with severe abdominal pain and bloody diarrhoea. Illness is usually self-limiting and resolves after about eight days. However, 2-7% of cases develop haemolytic uraemic syndrome (HUS), a form of renal failure; this is a more likely complication in young children. In fact, VTEC are the most common cause of diarrhoea-associated HUS in children.¹ In adults, VTEC infection may be followed by thrombotic thrombocytopenic purpura (TTP).

The primary reservoir is cattle, although VTEC have been isolated from a variety of healthy animal carriers including sheep, horses, goats and wild birds. While this organism was first recognized as a foodborne pathogen (the 'burger bug'), it is now known that it can also be transmitted through water, the environment and by direct contact with infected animals. Person-to-person spread has also been documented.

E. coli O157 is the most commonly reported VTEC in Ireland, the UK and the US, although other serogroups are capable of causing the same spectrum of illness, including O26, O111, O103 and O145. Many cases of O26 have been reported in Ireland, and including several cases in children during an outbreak in 1999.²

Facilities for VTEC diagnosis and confirmation in Ireland have improved greatly over the last few years. Since October 2000, the Public Health Laboratory at Cherry Orchard Hospital, Dublin has provided an *E. coli* O157 and non-O157 diagnostic service for clinical and food samples, including *E. coli* serotyping and verotoxin detection.

Methods

This is the fourth year that NDSC, in co-operation with Directors of Public Health in each health board region, have operated the epidemiological surveillance system for VTEC O157. Since 1999, specialists in public health medicine, senior area medical officers, area medical officers, microbiologists, medical laboratory scientists, surveillance scientists, infection control nurses, principal environmental health officers, and environmental health officers participate in a system whereby a standard dataset of information is collected at health board level on each case identified, and reported to NDSC. This information includes socio-demographic data, clinical data, possible risk factors and information on links between cases. Some participants in the system also notify non-O157 VTEC. The case definitions that have been used in this system are as follows:

- *Suspected*: a case of post-diarrhoeal HUS or TTP.
- *Probable*: a case with isolation of *E. coli* O157 from a clinical specimen (asymptomatic or symptomatic), pending confirmation of H7 or Shiga toxin or a clinically compatible case that is epidemiologically linked to a confirmed or probable case.
- *Confirmed*: a case that has isolation of *E. coli* O157:H7 from a specimen or isolation of Shiga toxin-producing *E. coli* O157:NM (non-motile) from a clinical specimen.

Probable cases that are subsequently confirmed as not H7 or Shiga toxin producing are removed from the database. A *travel-associated case* is defined as one where there has been international travel within two weeks prior to onset of illness.

Results

Seventy confirmed cases of VTEC O157 were notified to NDSC that had a date of onset of symptoms during 2002. Two of these cases occurred in non-residents and are not therefore included in the estimation of population-based rates. These two cases are however, included in the descriptive epidemiology. The numbers of confirmed cases and the crude incidence rates of VTEC O157 in Ireland from 1996-2002 are shown in table 1.

Table 1. Number of cases of confirmed VTEC O157 and crude incidence rate (95% CI) in Ireland, 1996-2002

Year	Numbers of confirmed cases (number confirmed cases including non-residents)	Crude incidence rate ^a (95% CI) per 100,000 population
1996 ^b	8	0.2 (0.1-0.4)
1997 ^b	31	0.8 (0.5-1.2)
1998 ^b	76	2.1 (1.6-2.6)
1999	51	1.4 (1.0-1.8)
2000	37(42)	0.9 (0.6-1.3)
2001	50 (52)	1.3 (0.9-1.6)
2002	68 (70)	1.7 (1.3-2.2)

^a For the years 1996-1999, census figures for 1996 were used while figures from the 2002 census were used to calculate rates from 2000-2002. The latter rates consequently differ from those published previously.

^b Data for the years 1996-1998 were taken from the report of the FSAI VTEC Working Group.³

Suspect/Probable cases

An additional 9 suspect/probable cases were reported to NDSC in 2002 that were not subsequently confirmed. These included 4 from the Mid-Western Health Board, three from the Southern Health Board and 1 each from the Western and North-Western Health Boards. Four of these cases had HUS. The remaining 5 cases were symptomatic contacts of confirmed cases; one of these was found positive by serodiagnosis. However, as these cases do not fit the case definition for confirmed cases, they are not included in any of the following analyses.

Regional distribution

As in previous years, regional variation was noted in the numbers of cases reported (Table 2), with the highest rates in the Midland, Western and South-Eastern Health Boards. These 3 health board regions appear to have consistently higher rates of VTEC O157 infection.

Table 2. Crude incidence rate (CIR) and age standardised incidence rate (ASIR) with 95% confidence intervals of confirmed cases of VTEC O157 by health board of residence, Ireland, 2002

Health Board	CIR (95% CI) per 100,000	ASIR (95% CI) per 100,000
ERHA	0.9 (0.4-1.3)	0.9 (0.4-1.4)
MHB	6.7 (3.3-10.0)	6.5 (3.2-9.8)
MWHB	0.3 (0.3-0.9)	0.3 (0.3-0.9)
NEHB	0.3 (0.3-0.9)	0.3 (0.3-0.8)
NWHB	1.4 (0.2-2.8)	1.4 (0.2-3.0)
SEHB	3.5 (1.8-5.3)	3.5 (1.7-5.3)
SHB	0.5 (0.1-1.1)	0.5 (0.1-1.1)
WHB	4.7 (2.6-6.9)	4.8 (2.6-7.0)
Total	1.7 (1.3-2.2)	1.7 (1.3-2.2)

Age-sex distribution

The highest incidence rate was recorded for young children, a trend also noted over the last few years (Figure 1).

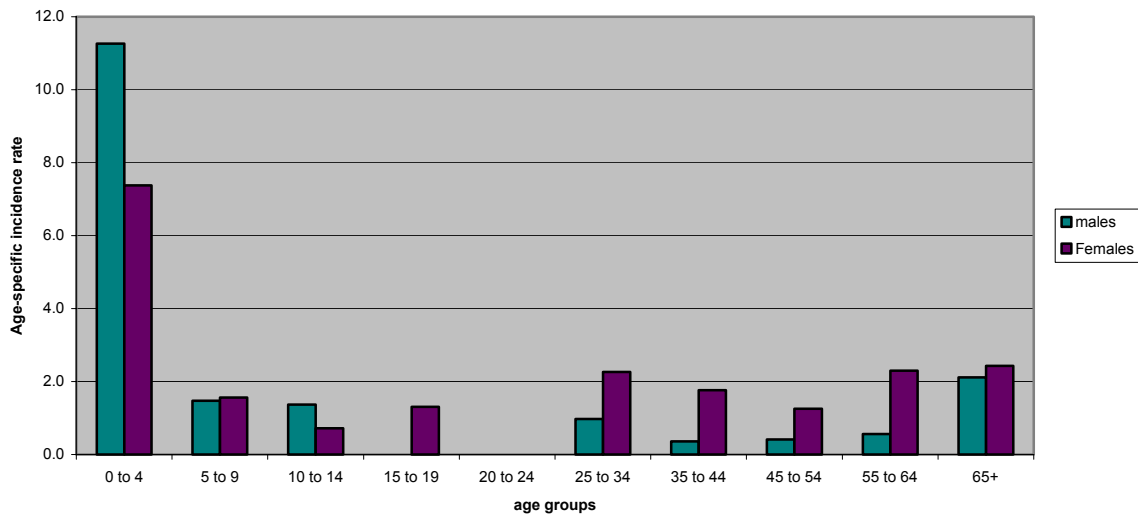


Figure 1. Age-specific incidence rate (per 100,000 population) of confirmed cases of VTEC O157, Ireland 2002

Clinical Features

In total, 61 out of the 70 confirmed cases (87%) were symptomatic. Reported symptoms among symptomatic cases included: bloody diarrhoea in 31 cases (51%), and HUS in 5 cases (8%). Of the 5 cases of HUS, 4 occurred in children under 5 years of age. One person who was admitted to hospital with VTEC O157 in 2002 developed additional medical problems during their hospital stay and died a number of weeks later. It is

unclear to what extent the VTEC infection contributed to the precipitation of their subsequent medical problems.

In the period 1999-2002, all but two cases of VTEC O157-associated HUS in Ireland were under 12 years of age. The median age of HUS cases was 4 years and the mean age (excluding one extreme value) was 5.2 years. In total, 12.5% of VTEC O157-infected children under 15 reported to the surveillance system developed HUS.

Seasonality of VTEC O157 cases

The majority of cases in 2002 occurred in late summer/early autumn, with a peak in August (figure 2).

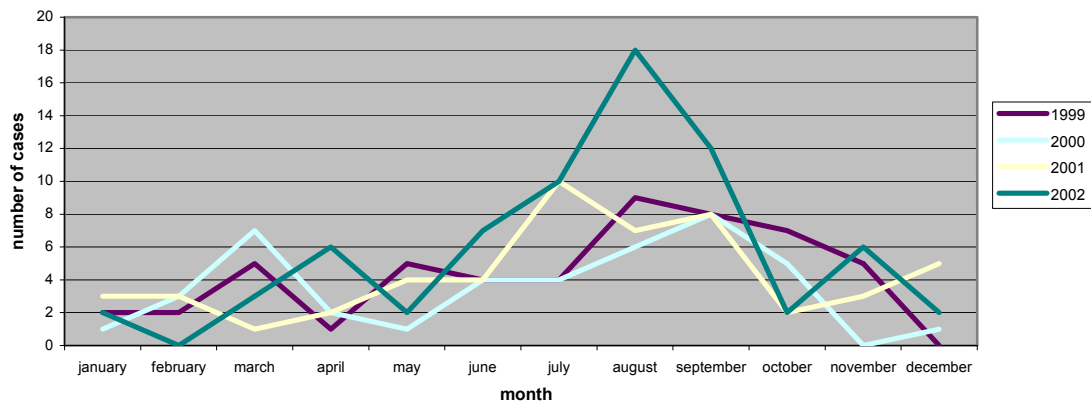


Figure 2. Confirmed cases of VTEC O157 by month of onset of symptoms, Ireland, 1999-2002

Travel-association

Nine cases were travel-associated. The countries visited within 14 days of onset of illness were Canada (1), UK (1), France (1), Spain (4), Canary Islands (1) and Tunisia (1).

Microbiological Investigation

In 2002, phage typing results were available for 54 cases out of 70. In total seven different phage types were reported. As in previous years, the predominant type detected was PT 32 (n=30). This was followed in frequency by PT 8 (n=9), PT 21/28 (n=6) and PT 14 (n=4), all of which were previously reported in Ireland (Figure 3).

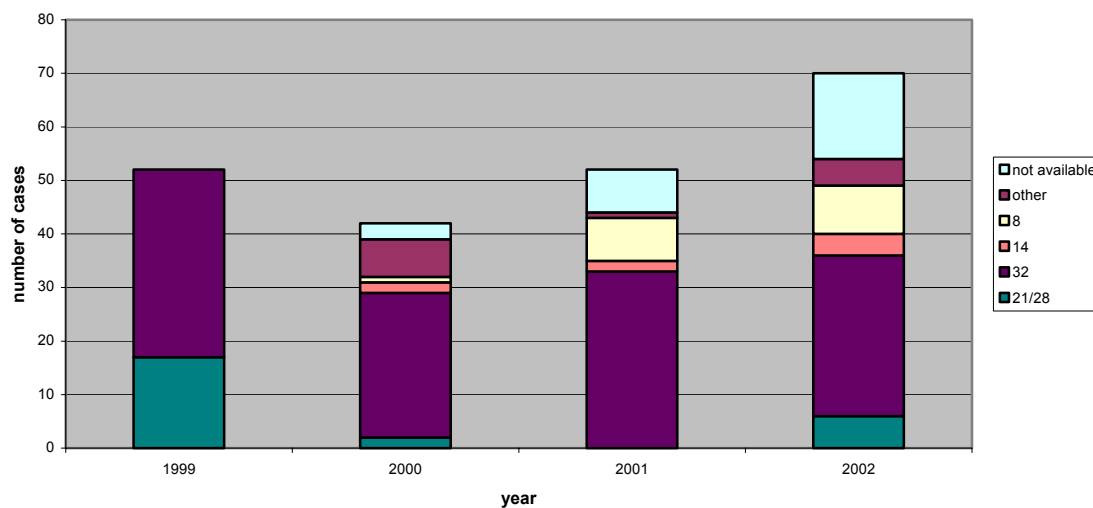


Figure 3. VTEC O157 phage types in Ireland 1999-2002

Epidemiological Investigation

As a result of following up apparently sporadic cases in 2002, 14 family outbreaks were detected by health board personnel among 29 confirmed cases, demonstrating the importance of investigating each case of VTEC infection. No general outbreaks were reported and no links were found with any food or water source.

Risk exposures

Descriptive epidemiological information was collected on all reported cases in an attempt to identify potential risk factors for exposure to VTEC. Seven (10%) cases reported consumption of unpasteurised milk or cheese. Of 58 cases where information was collected on water source, the water supply was public in 34 (59%) cases, private well water in 12 (21%) cases, from a group scheme in 6 (10%) cases and recorded as other (not public and not well) in 6 (10%) cases. Contact with farm animals was reported in 25 (36%) cases.

Non-O157 VTEC

One confirmed VTEC O26 in 2002, a child in the NWHB, was reported to the enhanced surveillance system.

Discussion

Seventy confirmed cases of VTEC O157 infection (1.7 per 100,000 population) were reported in Ireland in 2002, the highest rate recorded since 1998. Irish incidence rates are comparable to those published for Northern Ireland in 2002 (1.6/100,000). Higher rates have consistently been reported for Scotland (4.5/100,000 in 2002).

Fifty-seven per cent of cases had a date of onset between July and September. While a higher incidence during this time is a feature of VTEC infection, the particularly high rate in the summer of 2002 was influenced by the reporting of 14 cases of VTEC O157 in the Midland Health Board region with a date of onset during these 3 months. Two family outbreaks made up half of these cases, while the remaining 7 cases had 3 different phage types. Certain parts of the country appear to have consistently higher rates of VTEC O157 infection. The Midland Health Board, along with the Western and South-Eastern Health Boards, reported the highest rates of infection in 2000, 2001 and 2002.

Nine HUS cases were reported to the surveillance system in 2002, but only 5 were confirmed as being caused by *E. coli* O157. The remaining 4 suspect cases were all under 7 years of age; 2 were male and 2 were female. Three of the four also suffered from bloody diarrhoea. In HUS surveillance studies in different countries, up to 91% of cases were found to have evidence of VTEC infection.¹ It is possible that some or all of these 4 suspect cases were caused by VTEC.

An additional probable case in the database was epidemiologically linked to a confirmed case but was confirmed only by serodiagnosis. The current case definition requires cases to be culture positive. While this case is a laboratory-confirmed case, it is not included in our analyses because it falls outside the case definition. Under the new case definition in the proposed infectious disease legislation, cases of HUS and TTP which are serodiagnosed as being caused by VTEC, will be included.

The reporting of a VTEC O26 case again in 2002 highlights the importance of extending the enhanced surveillance system to non-O157 VTEC. This was probably not the only confirmed case of O26 in Ireland in 2002. Additional O26 cases were notified under the weekly notification system, although their toxin-producing abilities are not reported.

Acknowledgements

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References

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