E. coli O157 outbreaks in Scotland: VTEC Enhanced Surveillance at HPS and the crucial role of EHOs

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E. coli O157: Challenges for Public Health in Scotland (1)

- Low infective dose
- Hidden risks – secondary spread, asymptomatic cases
- Potential for serious complications and fatalities
  - Haemolytic uraemic syndrome (HUS) ~ 9% of cases
  - HUS is the major cause of acute renal failure in children
- Risks can be minimised, but not eliminated
- National/global food chains & travel extend risk
- The organism continues to evolve
Challenges for public health (2)

- Unpredictable – self-limiting or serious illness?
- Treatment options limited – problems with antimicrobials
- Social and economic costs (vs costs of prevention)
- Problems of differential diagnosis & co-morbidity
- Travel-related/imported infections/outbreaks
- Risk can be minimised but not eliminated
- The organism is still evolving
Data outwith Scotland courtesy of Health Protection Agency Belfast/London, Health Protection Surveillance Centre Dublin (Figures 2009 onwards are provisional; data for England, Wales & Ireland include verotoxin positive cases only.)
E. coli O157: Culture positive cases
Outbreak or sporadic, 1984-2010

(2010 figures are provisional)
Sporadic *E. coli O157* cases:

Risk factors identified by HPS national case-control study*

- **Sporadic** infection ~ 80% of cases in Scotland
- Contact with animal faeces** was the risk factor most strongly associated with **sporadic** infection OR 3.65, P <0.0005 (95% 1.81, 7.34)
- Reflects findings in other countries
- No foods were associated with risk

*Locking M et al, Epidemiology & Infection, 2001

**Predominantly farm animals, household pets not associated with risk
Enhanced HPS surveillance of *E. coli* O157 in Scotland

- HPS collects & integrates data from various sources:
  - Laboratories – Hospital Labs & Scottish *E. coli* O157 Ref Lab
  - Exposures – Public & Environmental Health Teams
  - Health Outcomes – P & EH Teams, Patients, Clinicians, GPs

- Population based, standardised dataset:
  - Provides real-time data on all confirmed cases, not just outbreaks

- Identifies outbreaks, improves available data, eg:
  - Imported infections = 14% of all cases (only 2% previously)
  - Secondary spread = 12% of all cases (not identifiable previously)
  - Asymptomatic infection = 10% of all cases (ditto)
  - Now includes verotoxigenic cases of non-O157 *E. coli*
E. coli O157 culture positive cases 2010: NHS Board of residence at time of onset

- Isolation rate per 100,000 population (2009 figures)

Scotland 4.1 (4.6)

Greater Glasgow & Clyde 2.8 (2.4)
Lanarkshire 2.5 (3.4)
Ayrshire & Arran 5.4 (6.0)
Dumfries & Galloway 12.1 (8.1)

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)

(NB – rates may be artificially elevated in areas with small population totals such as islands; 2010 figures are provisional)
E. coli O157 outbreaks & awareness: Central Scotland outbreak 1996/1997

- Meat products
- Sourced from local butcher
- Cross-contamination

506 people ill
21 deaths

(Courtesy of Bill Reilly)
Risk factors - *E.coli* O157 outbreaks:
- Remain varied & cannot be assumed

(By kind permission of Billy Cullinane, NHS Ayrshire & Arran)
Salad-related *E. coli* O157 Outbreak in North East & South West Scotland 2007 - Summary

- Apparent point source outbreak in NE – single food outlet
- Strong evidence suggesting salad leaves
- Further cases of in SW – some evidence implicating salad again
- Rare strain of *E. coli* O157 - strongly suggested common source
- Detailed EHO and FSA(S) investigations, alongside HPS & HP Teams
- Salad distribution chain appeared to be common to both NE & SW
- Could not identify where salad originated, or how contaminated

(Webster et al, Eurosurveillance 2007)
Food types implicated or suspected in VTEC* outbreaks include:

- Meat & meat products – burgers, minced beef, gravy, meat pie, cold meats, barbeque foods
- Milk – both pasteurised and raw milk
- Cheese, including farmhouse-produced cheeses
- Salad leaves and other ready-to-each veg eg spinach
- Other ready-to-eat products eg filled wraps, nuts
- Fruit, berries, fruit juices
- Handling food items contaminated by manure, soil etc
- Poultry, home baking, trifle

- Water – private supplies & burn water

(*Data largely based on E. coli O157 outbreaks, not limited to Scotland)
Waterborne *E. coli* O157 Outbreaks in Scotland, 1996-2009

- 15 waterborne outbreaks, 105 people ill
- All outbreaks involved private water supplies (PWS)
- *E. coli* O157 isolated from 14/15 supplies
  - 13/15 – involved farms and/or livestock contamination
  - eg PWS tank on pastureland, below ground level
  - 6/15 – Same *E. coli* O157 strain in livestock, humans + PWS
  - 6/15 – Involved visitors

(2009 figures are provisional)
Farm-related *E. coli* O157
Outbreaks in Scotland, 1996-2009

• 21/121 outbreaks (17%) were linked to farm premises

• 15/21 (71%) were private farms:
  – 9 outbreaks involved at least one farm resident
  – 5 involved visiting relatives/friends
  – 1 involved farm workers

(2009 figures are provisional)
Summary

- **Risk factors remain varied**
  - Some can only be influenced at national and global level
  - Cannot assume same risk/outcome at different times/places when both phage type and serotype strains are changing

- **Legislation can minimise but not eliminate risk**
  - Food and private water supplies remain important sources
  - Risk is present on private as well as open farms
  - It cannot be assumed that regular exposure (eg to livestock) reduces the risk of infection, or of serious outcomes

- **Early diagnosis is crucial**
  - Apply low threshold for suspecting & testing for VTEC
  - Provide infection control advice at earliest point
  - Acquiring infection by secondary spread does not reduce risk of HUS
Information sources

• HPS *E.coli* O157 webpage - Case numbers & rates, guidance, leaflets, posters, articles
  http://www.hps.scot.nhs.uk/giz/e.coli0157.aspx (zero, not “O”)
  (includes link to Health Protection Network VTEC Guidance for Scotland)
• Godstone Open Farm outbreak, Surrey 2009 – Independent inquiry & recommendations
• HPS guidance/advice on reducing risk of *E.coli* O157 for rural communities & visitors
  http://www.hps.scot.nhs.uk/giz/guidelinedetail.aspx?id=38604
• HSE – alert - revised guidance for Open Farms (also relevant for other farms)
  http://www.hse.gov.uk/agriculture/articles/health-alert-ecoli.htm
• Scottish Government – various sources of guidance and advice
  http://www.scotland.gov.uk/Publications/2003/06/17334/22401
• On-farm risk assessments for application by farmers (Royal Highland Educational Trust)
  http://www.rhet.org.uk/EZEdit/view.asp?MID=95
• *E.coli* O157 Task Force (Scottish Executive & FSA)
• Haemolytic Uraemic Syndrome Help (Info & support for those affected by *E. coli* O157)
  http://www.ecoli-uk.com/index.php
• Outbreaks of Infectious Intestinal Disease in Scotland (most recent HPS annual report)
• Food Standards Agency (Scotland) (CookSafe, RetailSafe & other guidance)
  http://www.food.gov.uk/scotland/safetyhygenescot/
Thank you for listening...
## Details of general outbreaks of VTEC in open farms

<table>
<thead>
<tr>
<th>Year</th>
<th>No outbreaks</th>
<th>No ill &amp; positive</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1</td>
<td>5</td>
<td>Two related households visited a Country Park with petting area. (PT2)</td>
</tr>
<tr>
<td>2002</td>
<td>2</td>
<td>6</td>
<td>Both outbreaks involved two related households, and no direct animal contact was reported in either incident. One outbreak involved a Country Park, the other a farm. Neither had specific petting areas but had livestock on the premises. (PT21/28; PT8)</td>
</tr>
<tr>
<td>2004</td>
<td>1</td>
<td>6</td>
<td>Four cases in two related households from Scotland, and two unrelated cases from England, visited a &quot;children’s farm&quot;. (PT31 – Scotland, PT21/28 - England)</td>
</tr>
<tr>
<td>2005</td>
<td>1</td>
<td>1</td>
<td>Two related households visited a pet farm. No direct animal contact was reported. (PT54)</td>
</tr>
<tr>
<td>2008</td>
<td>1</td>
<td>2</td>
<td>Two unconnected children petted lambs at a Country Park, which were in a temporary pen off the picnic area. The premises did not usually have such direct animal contact and the lambs were only there temporarily. (PT21/28)</td>
</tr>
</tbody>
</table>

Total 6 20
E. coli O157: Culture positive cases reported to HPS*: % of cases per phage type 1993-2010

*Phage type results are reported to HPS VTEC Enhanced Surveillance by the Scottish E. coli O157/VTEC Reference Laboratory; 2010 figures are provisional
Species identified with *E. coli* serogroups* (includes Scotland)

- Cattle, sheep, pigs, including calves & lambs
- Goats, horses
- Cat, dogs
- Rabbits
- Rooks, duck, chicken, gulls, finches, starlings
- Deer
- Slugs, flies, frogs
- Llama

- Survival in silage, slurry, dung, soil, sawdust
- On child’s stroller & shoes

(*Predominantly *E. coli* O157 but includes non-O157 VTEC identifications)