

### Enhanced surveillance of verocytotoxin-producing Escherichia coli in England: 2009-2012

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#### Overview

- Public health follow-up of VTEC cases in England
- Demography of VTEC cases
- Disease severity
- Risk exposures amongst cases
- The impact of molecular methods on public health follow-up



# Detection of VTEC O157 at the local lab





#### Public Health Follow-up

- Identify at risk groups
- Contact screening
- Exclusion
- Enhanced surveillance interview
- Linked cases?

	Health Protection Agency				
	The VTEC operational manual				
Operational guidance for HPA staff dealing with cases and incidents of VTEC infection					
	Part A. Operational guidance for HPUs				
Part B. Responsibilities within the HPA for the identification and alerting of individual cases and clusters of VTEC					
HQSD 28.0	Authorised By Trish Mannes Effective Date 17/02/2011 Page 1 of 26 THIS COPY IS UNCONTROLLED WHEN PRINTED				

# Public Health England VTEC surveillance in England

Enhanced surveillance system implemented in January 2009

Aim: To collect a standardised clinical, microbiological and epidemiological dataset of VTEC in England.

Methods: Reconciles microbiological data from specimens submitted to GBRU with surveillance data collected on the enhanced surveillance questionnaire (ESQ).

ESQ collects:
Demography,
Clinical information
Exposures- travel history; food; day trips; environmental exposures



#### VTEC cases: 2009-2012



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# Public Health VTEC serogroups: 2009-2012 England

VTEC O157 was the most frequently detected serotype (98.8% of cases).

19 different non-O157 serogroups detected among 44 cases

O26 was the most common (n=15), followed by O104 (n=6)

Compared to our neighbours:

- Republic Of Ireland now report more non-O157 than O157 VTEC (particularly O26)
- European surveillance data indicate over half of VTEC infections are non-O157 strains.
- However, un-surprising given frontline detection of VTEC- No O157 strains were sorbitol fermenting, compared to 33 (75.0%) non-O157 strains.

## Public Health VTEC 0157 sub-types: 2009-2012 England

36 different O157 phage-types (PT)

PT 8 and PT 21/28 each comprised ~30% of O157 cases

Differences between domestic and travel related cases:



Two-thirds of all strains carried VT2 genes, 33% encoded VT1 + VT2 while VT1 only strains were rare (n=20).

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# Public Health England Incidence of VTEC: 2009-2012

Overall incidence: 1.80 per/100,000 person years Highest at 7.63 in those aged 1-4 years

Higher incidence in adult females vs males:

- Aged 20-59 (RR=1.43, p<0.001)
- Aged 60+ (RR=1.32, p<0.001)



Enhanced surveillance of VTEC in England: 2009-2012



- The majority (92.8%) of cases reported diarrhoea
- 61% bloody diarrhoea
- 34.3% were hospitalised
- No difference in age or gender
- Were known, median duration of illness was 6 days (IQR 1:92)

HUS reported on the ESQ or laboratory referral form:

• 5.5% of VTEC cases (n=202) developed HUS



Progression to HUS varied by gender & age-group.

3/4 cases in children

The majority (57%) were infected with strains of O157 PT 21/28 VT2

13 deaths were reported (all in adults);



VTEC cases progressing to HUS (%)



**Disease severity** 

An additional 115 cases of HUS were reported to the system with no evidence of VTEC infection:

- No specimen was submitted for 13 cases
- 15 cases had *E.coli* isolated from faecal specimens but *stx* genes were not detected (4 with *eae*)
- 87 had serum samples only submitted to GBRU & were negative
- ESQ's were received for 40 cases (35%)

The age distribution differed to VTEC-HUS cases:

- Most (65%) were adults (vs 25% VTEC-HUS)
- A fifth were aged over 60

3 cases died: two cases with an unidentifiable *stx* negative *E.coli* & one who provided a negative serum sample only.



#### **Disease severity**

#### Predictive percentage chance of developing HUS by age group, symptoms and antibiotic treatment



### **Geographical distribution**

Fig. Incidence of VTEC by Region (former HPA): 2009-2012



Incidence is highest in Yorkshire & Humber, the North East and South West regions.

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Incidence was over four times higher in rural vs urban areas (RR=4.39, p<0.001).

#### **Geographical distribution** Public Health



**XOX** 



#### **Exposures-Sporadic**

- 1722 Primary domestic, sporadic cases
- Farm settings included open farms and private farms
- Non-farm settings include such as in fields, at agricultural events etc.
- The most frequently cited animals cases had contact with were Cattle (n=173), followed by horses (148) and Sheep (133).

Environmental exposures	No. of cases (%)
Any environmental	681 (39.5)
Indirect/direct contact with	
animals/environment	649 (37.7)
Farm setting	301 (17.5)
Non-farm setting	348 (20.1)
Private water supply	74 (4.3)
Open water swimming	63 (3.7)



#### Exposures (sporadic infection)

	Exposed		X <sup>2</sup> test for trend p-			
Exposure/urbanicity group			value			
Any environmental exposure						
Urban	340	29.9%				
Town & Fringe	113	53.6%				
Rural	228	61.3%	<0.0001			
All cases	681	39.5%				
Direct/indirect contact with farm animals/faeces on farms						
Urban	168	14.7%				
Town & Fringe	51	24.2%				
Rural	82	22.0%	<0.0001			
All cases	301	17.5%				
Direct/indirect contact with farms animals/faeces in non-farm setting						
Urban	156	13.7%				
Town & Fringe	57	27.0%				
Rural	135	36.3%	0.0002			

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- All (and each) environmental & animal exposures were reported significantly more often from cases living in rural areas vs urban areas (RR 1.28, p <0.001).</li>
- Contact with farm animals was more frequently reported in rural cases (RR=2.28, p <0.001).</li>
- Where contact with farm animals was in a farm setting, 85% of urban residents reported contact through an open farm while 59% of rural residents reported access elsewhere.
- Scottish National Action Plan for VTEC- published December 2013- 86 recommendations to disrupt transmission

http://www.scotland.gov.uk/Publications/2013/11/8897/download





#### Exposures of VTEC cases

- 75% of cases ate out.
- Most cases (88%) reported meat consumption:
  - Including handling/eating beef (56%)
  - Cured and processed meat (52.1%)
- A fifth reported shopping at independent butchers
- A small number (n=41) reported consumption of unpasteurised (raw) milk
- Handling and consumption of raw fruit and vegetables including salads were reported by 80.2% of cases.





#### VTEC outbreak detection

#### Traditional outbreak detection:

- Increase recognised at a local level
- Increase in a particular phage type triggers Exceedance
- Particular exposure appears on enhanced surveillance questionnaire (ESQ)

#### The use of MLVA

- MLVA interpreted by GEZI and GRBU scientists
  - Some work still to be done on interpretation of SLVs, DLVs, TLVs and SLVs of SLVs and how to define a cluster

## Categorisation of cases: 2013



# Domestic sporadic cases reduced by 20% Five fold increase in cluster cases

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#### VTEC in 2013

Of 653 cases :

- 30 (5%) are part of traditionally detected outbreaks
- 46 (7%) are household clusters
- 199 (30%) are sporadic cases
- 124 (19%) are travel-related
- 278 (43%) are part of clusters that we would <u>not</u> necessarily have detected through traditional means
- That is an additional 62 clusters to investigate!



#### **MLVA clusters**

1. Regional and temporal distribution of clusters

1 PHEC's	No temporal	Temporal
Single	2	8
Multiple	8	44

2. Regional and temporal distribution of cluster cases

PHEC's	No temporal	Temporal
Single	7	22
Multiple	16	239

Temporal= most cases fall within two months of another case in the cluster



#### How to deal with MLVA clusters

Cases infected with VTEC of the same MLVA profile are almost certainly linked, but:

• What is the chance of an epidemiological investigation finding a vehicle of transmission?

Algorithm for investigating MLVA clusters to balance resources with impact of cluster and chance of finding a vehicle of transmission

• Caveat: All outbreaks are different and need careful interpretation

# Public Health VTEC other than O157 England

Since December 2012, implementation of GI PCR at frontline laboratories

Addresses the diagnostic deficit/bias towards detection of O157 strains

Five laboratories using PCR- located in low incidence areas

In 2014 to date, 90 non-O157 isolates versus 27 O157 isolates

- In comparison to O157, greater numbers of non-O157 serotypes, the majority are VT1 only and intimin negative
- 21/90 (23%) had both eae and VT2
- Unknown pathogenecity of some strains, pragmatic approach to health protection

However, outbreaks (of severe disease) can and do occur

- In 2012, VTEC O26 outbreak in a nursery
- Currently In England, VTEC O117 VT1 only circulating amongst MSM community



## **Concluding remarks**

- Good level of reporting with improvement over time
- Concurrence with previously published laboratory surveillance data in England and elsewhere..

-BUT collection of more detailed standardised information increases reliability and accuracy

• The ESQ is not exhaustive and exposure data do not provide proof of causality for individual sporadic cases...

-BUT do provide a high level picture on potential risk factors among cases

- Hypotheses generating...
- Monitoring and analysis of longer term trends including emerging subtypes and risk factors.



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