

SHORT REPORT

Human Vero cytotoxigenic *Escherichia coli* (VTEC) O157 infection linked to birds

O. O. EJIDOKUN^{1*}, A. WALSH¹, J. BARNETT¹, Y. HOPE², S. ELLIS²,
M. W. SHARP³, G. A. PAIBA⁴, M. LOGAN⁵, G. A. WILLSHAW⁶
AND T. CHEASTY⁶

¹ Gloucestershire Health Protection Team, Cheltenham & Tewkesbury Primary Care Trust, Cheltenham, Gloucestershire, UK

² Tewkesbury Borough Council, Council Offices, Tewkesbury, Gloucestershire, UK

³ Veterinary Laboratory Agency, Luddington, Stratford-upon-Avon, Warwickshire, UK

⁴ Veterinary Surveillance Strategy Team, New, Endemic and Zoonotic Disease Division, DEFRA, London, UK

⁵ Microbiology Department, Gloucestershire Hospitals NHS Foundation Trust, Gloucestershire, UK

⁶ Laboratory of Enteric Pathogens, HPA Centre for Infections, London, UK

(Accepted 9 May 2005, first published online 7 September 2005)

SUMMARY

Vero cytotoxin-producing *Escherichia coli* O157 (VTEC O157) infections are a threat to public health. VTEC O157 has been isolated from gulls but evidence of transmission to humans from birds has not been reported. We recount an incident of VTEC O157 infection affecting two sibling children who had no direct contact with farm animals. An outbreak control team was convened to investigate the source of infection, its likely mode of transmission, and to advise on control measures. Human and veterinary samples were examined and the human isolates were found to be identical to an isolate from a sample of bird (rook) faeces. Cattle, rabbit and environmental samples were negative. This report provides evidence that birds may act as intermediaries for human infection with VTEC O157.

Infections caused by Vero cytotoxin-producing *Escherichia coli* O157 (VTEC O157) constitute a threat to public health. Symptoms include bloody diarrhoea, haemorrhagic colitis and haemolytic uraemic syndrome. Most infections are transmitted by food, animal contact (direct or indirect) and person-to-person spread [1]. VTEC O157 carriage has been reported in gulls [2] but to date, evidence of transmission of infection to humans from birds has not been reported.

A family outbreak of VTEC O157 infection occurred on a private beef cattle farming estate in

Gloucestershire in July 2002 affecting two siblings and their mother. The index case, a 4-year-old girl in a family of four, developed bloody diarrhoea on 13 July. Two friends from the playgroup she attended had visited her at home on the same day. On 18 July, her 9-month-old sister developed similar symptoms but neither girl required hospitalization. The children had no direct contact with farm animals, and had not visited any other farm prior to their illness. Their father worked as a forester on the farm and only occasionally moved the cattle herd. He had trapped 100 rook birds in June at the bullpens, where bird scavenging of cattle troughs had taken place. He removed the birds from their cages before they were humanely culled. Both parents were asymptomatic. The family did not keep pets.

* Author for correspondence: Dr O. O. Ejidokun, Gloucestershire Health Protection Team, Unit 43, Central Way, off Arle Road, Cheltenham GL51 8LX, Gloucestershire, UK.
(Email: toyin.ejidokun@glos.nhs.uk)

They consumed pasteurized milk and received water from a public supply. Seven other families with five young children resided in a courtyard arrangement on the farm. None of these individuals was ill.

The household members were interviewed using a structured questionnaire, which examined the pattern and symptoms of illness. Food histories, water consumption and other potential contributory exposures in the 2 weeks before the children became ill were explored. Potential sources of infection such as food and drink were eliminated using the questionnaire and possible animal-associated sources explored. No one at the playgroup reported any symptoms. An outbreak control team (OCT) was convened to investigate the source of infection, its likely mode of transmission, and to advise on control measures. The OCT recommended strict adherence to hygiene advice for the family and stool samples from both parents and visiting friends were screened. A public information leaflet on VTEC was developed and distributed on the estate and all general practitioners in the area were informed.

Human faecal samples were screened initially at the Gloucester Public Health Laboratory. Isolates of presumptive *E. coli* O157 were sent to the Laboratory of Enteric Pathogens (LEP) for confirmation, phage typing and tests for Vero cytotoxin (VT) genes [3]. Eighty-three samples taken on the farm 10 days after the index case was identified, were tested at the Veterinary Laboratory Agency (VLA), Luddington by immunomagnetic separation (IMS) [4]. These were 58 pooled cattle faecal specimens, five water-trough samples, 19 sets of rabbit droppings and one sample of rooks' faeces collected from the feed troughs. Positive colonies were forwarded to VLA, Weybridge for confirmation and toxin testing, and were phage-typed at the LEP.

Strains of *E. coli* O157 phage type (PT) 2, with genes for VT2 were isolated from all three human cases and the bird faeces. The isolates were shown to be indistinguishable by pulsed-field gel electrophoresis (PFGE) [3] (Fig.). Stool cultures from the father and two visiting friends were negative. Isolates of VTEC O157 were not recovered from the cattle, rabbit or environmental samples.

The microbiological evidence suggests that in this outbreak, indirect contact with wild birds' (rooks) faeces can be a risk factor for acquiring human VTEC O157 infection with person-to-person transmission occurring in the family. The children may have had

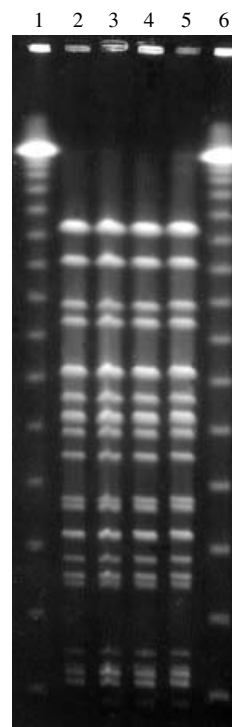


Fig. Application of pulsed field gel electrophoresis (PFGE) to strains from human cases (lanes 2–4) and bird (rook) faeces, (lane 5). Molecular size markers are in lanes 1 and 6.

indirect contact with bird faeces via their father's soiled work shoes or contaminated overalls. The low infectious dose of VTEC makes these items potential hazards, particularly to children or those who handle or wash them. National guidelines for the control of VTEC infections [1] recommend that for those in direct contact with animals, work shoes should be kept away from the main living areas and overalls should be laundered separately. This advice is not just for the safety of the worker but also for the safety of their immediate family.

Cattle are recognized as the main reservoir for VTEC, although goats [5] and a range of other animals including rabbits have been implicated in infections on farms. Most cattle shed VTEC O157 intermittently in low numbers and the prevalence of positive animals in a herd may be very variable. This could have resulted in failure to isolate the organism from the cattle, despite sufficient bovine samples having been collected to detect a prevalence of VTEC O157 of 10% or more in the cattle with 95% probability. The origin of the strain carried by the rooks is unknown. It could have been acquired from the

investigated farm or from the local area by direct contact with cattle faeces or via environmental contamination including contact with animal feed troughs. Strains of VTEC O157 PT2 VT2 with a similar profile to that implicated in this outbreak caused other apparently unlinked human infections in the area (G. A. Willshaw, personal communication) suggesting that the strain was circulating in the community at the time.

This outbreak shows that potential sources of infection other than cattle should be considered when investigating *E. coli* O157 outbreak-associated farms.

DECLARATION OF INTEREST

None.

REFERENCES

1. **PHLS Advisory Committee on Gastro-intestinal Infections.** Guidelines for the control of infection with Vero cytotoxin producing *Escherichia coli* (VTEC). *Commun Dis Public Health* 2000; **3**: 14–23.
2. **Wallace JS, Cheasty T, Jones K.** Isolation of Vero cytotoxin-producing *Escherichia coli* O157 from wild birds. *J Appl Microbiol* 1997; **82**: 399–404.
3. **Willshaw GA, Smith HR, Cheasty T, Wall PG, Rowe B.** Vero cytotoxin-producing *Escherichia coli* O157 outbreaks in England and Wales, 1995: phenotypic methods and genotypic subtyping. *Emerg Infect Dis* 1997; **4**: 561–565.
4. **Paiba GA, Gibbens JC, Pascoe SJS, et al.** Faecal carriage of vero cytotoxin-producing *Escherichia coli* O157 in cattle and sheep at slaughter in Great Britain. *Vet Rec* 2002; **150**: 593–598.
5. **Milne LM, Plom A, Strudley I, et al.** *Escherichia coli* incident associated with a farm open to members of the public. *Commun Dis Public Health* 1999; **2**: 22–26.