Clinical and laboratory observations on patients from a nursing home outbreak of verotoxin-producing *E coli* (0157:H7 strain)

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ABSTRACT: Beginning on September 7, 1985, an outbreak of bloody diarrhea affected 53 of 169 residents of a London, Ontario nursing home. The most severely affected patients were transferred to local general hospitals under the care of a number of physicians for investigation and treatment. Overall, 19 patients died during the outbreak. Clinical and laboratory information on the 18 patients admitted to this institution are reported. A majority of these patients had either verotoxin detected in fecal extracts or *Escherichia coli* 0157:H7 isolated from their stools. The mortality rate at this institution exceeded 75% (14 patients). Six patients developed hemolytic uremic syndrome and none of these survived the illness. *Can J Gastroenterol* 1988; 2(2):57-59

Key Words: *E coli* 0157:H7, Hemolytic uremic syndrome, VTEC, Verotoxin

AN OUTBREAK OF BLOODY DIARRHEA occurred in September 1985 in a London, Ontario nursing home which affected 53 of 169 residents and 18 staff members. Nineteen of the residents died during the outbreak. Eighteen severely ill residents were transferred to St Joseph's Hospital for investigation and treatment under the care of several physicians. Information reported in this article was derived from retrospective hospital chart review.

CLINICAL INFORMATION

Between September 9 and September 28, 1985, 18 seriously ill patients with acute diarrhea were transferred to St Joseph's Hospital from a local nursing home. Although 17 of the patients had rectal bleeding, only 10 complained of abdominal pain on admission. Information on nursing home transfer forms indicated that 12 patients had a pre-admission diagnosis of Alzheimer's disease or dementia and that 16 patients

had additional significant health problems. These included atherosclerotic heart disease (seven patients), arthritis (six patients), hypertension (five patients) and cerebrovascular disease (three patients).

All patients initially had negative stool cultures for *Campylobacter* species, *Salmonella* species, *Shigella* species and *Clostridium difficile*. Special cultures for verotoxin-producing *Escherichia coli* organisms (VTEC) were then requested and the first positive verotoxin assay was reported on September 15, eight days after the outbreak began. The first positive culture for *E coli* 0157:H7 was reported on September 18. This organism was ultimately isolated from the stools of nine patients. Verotoxin was identified in fecal extracts from all but one culture-positive patient and in fecal extracts from three additional culture-negative patients (Table 1).

Although 15 patients were found to have an elevated serum creatinine at some point during hospital admission, 12 patients were felt to be clinically dehydrated and 10 patients were anemic on admission (Table 1), a diagnosis of hemolytic uremic syndrome could be

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TABLE 1
Clinical and laboratory features of VTEC infected patients

	Patient																	
	1	2	3	4	5	6*	7	8	9	10	11	12	13	14	15	16	17	18
Age (years)	78	84	87	88	94	78	95	93	95	91	85	84	99	93	89	80	86	92
Rectal bleeding	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
Abdominal pain	x			x	x			x			x	x	x		x			x
Anemia	x	x	x			x	x	x			x	x	x			x		
Elevated creatinine	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
Hemolytic-uremic syndrome		x		x						x	x	x					x	
<i>E coli</i> 0157:H7 isolated	x				x						x	x	x	x		x	x	x
Verotoxin positive	x			x	x	x	x				x	x	x	x		x		x
Antibiotics received	x	x				x		x	x			x	x	x	x	x	x	
Died	x	x		x		x	x		x	x	x	x	x	x	x	x	x	

* Male patient

made with confidence for six patients only (Table 2). The interval from the initial episode of diarrhea to the development of hemolytic uremic syndrome was between five and nine days (mean seven days). The degree of thrombocytopenia and renal dysfunction measured in these patients was quite variable and not all patients had all three features classically associated with this disorder (1). All diagnosed patients had pathologic evidence of glomerular endothelial damage with fibrin deposition (2) and two additional patients without clinical or laboratory evidence of hemolytic uremic syndrome had positive glomerular capillary fibrin staining at autopsy. This phenomenon would suggest that hemolytic uremic syndrome in this setting can present with a variety of findings ranging from asymptomatic lesions to the classical triad of fulminant renal failure, severe thrombocytopenia and microangiopathic hemolysis.

Fourteen of the 18 patients admitted died during the course of their illness. The interval from initial symptomatology to hospital transfer was zero to five days (mean 2.5 days). The interval from first symptom to either discharge or death was two to 36 days (mean 17 days). No factor was identified which appeared to improve patient survival.

Antibiotic treatment was initiated in an uncontrolled fashion on 11 patients from two to 16 days (mean five days) after the onset of diarrhea. Single and combination drugs were used in a variety of treatment regimens. Nine of 14 patients who died received antibiotics as did two of the four survivors. Five of the six hemolytic uremic patients were treated in

an uncontrolled fashion with fresh frozen plasma (1 to 4 units each) after the diagnosis was established. None of the hemolytic uremic patients survived the illness and all died while in hospital. The age of affected individuals was from 78 to 99 years (mean 88 years). All survivors were greater than 87 years of age and three of the four survivors were greater than 92 years of age.

DISCUSSION

The association of VTEC organisms with human enteric illness and renal disease is a fairly recent phenomenon. In 1977, strains of toxin-producing *E coli* were described which produced a distinctive cytotoxic effect in tissue culture on Vero cells obtained from African green monkey kidneys (3). The toxin identified was termed verotoxin. *E coli* 0157:H7 has been incriminated as the probable cause of a number of sporadic cases and outbreaks of hemorrhagic colitis in the United States and Canada beginning in 1982 (4-9). The classification system for *E coli* organisms has recently undergone a major revision with these

organisms now referred to as enterohemorrhagic *E coli* (EHEC) (10). Recent information suggests that the toxin elaborated by these organisms is similar to Shiga toxin produced by *Shigella dysenteriae* and that at least three distinct subtypes exist (11).

The hemolytic uremic syndrome was first described in 1955 (12). Since that time, a number of inciting events have been implicated in its etiology (13) with *S dysenteriae* endotoxin being one of the first products from an infectious agent implicated (14). In 1983, Karmali and associates (15,16) first reported sporadic cases of hemolytic uremic syndrome which appeared to be linked to VTEC infections. A subsequent article reported evidence of VTEC infection from at least six different O serogroups in 24 of 40 pediatric-aged hemolytic uremic patients (17). Neill and associates (18) reported the association of *E coli* 0157:H7 with hemolytic uremic syndrome in adult patients in 1985.

The salient features of this report are the high mortality rate and the relatively high incidence of hemolytic uremic

TABLE 2
Clinical and laboratory features of patients with hemolytic uremic syndrome

Patient	Initial episode to HUS (days)	Microangiopathy	Platelet count 10 ⁹ /L	Serum creatinine (μmol/L)
2	5	+	238/188*	198/1022*
4	6	+	420/77	124/383
10	7	+	460/70	90/121
11	9	+	238/88	88/194
12	8	+	321/128	82/180
17	8	++	218/46	99/162

HUS Hemolytic uremic syndrome; * Admission value/ HUS value

syndrome associated with the outbreak. The fact that an aged and otherwise ill patient population was involved is of prime importance. With two exceptions (8,9), previously reported outbreaks have involved younger age groups. All have reported lower mortality rates. Food-borne transmission has been the common thread in all previous reports and this outbreak was no exception with the likely source being sandwiches served during lunch on September 5 (19). During the outbreak, there was epidemiological evidence of person to person transmission of the infectious agent as well as primary infection (19).

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