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Shiga toxin-producing *Escherichia coli* in Connecticut Laboratories

Shiga toxin-producing *Escherichia coli* (STEC) is an important cause of diarrhea and hemolytic uremic syndrome (HUS). The most common STEC that causes illness in the United States (US) is *E. coli* O157:H7. However, studies in other countries suggest that disease caused by non-O157 STEC is at least as prevalent as disease caused by O157. Non-O157 STEC have also caused several outbreaks in the US. An outbreak of O111 infections in Texas (1) and O121 in Connecticut were reported in 1999.

Before 1995, Shiga toxin was detected by using highly technical assays available only at reference and research laboratories. Since 1995, the Food and Drug Administration has licensed several rapid enzyme immunoassays (EIA) for the detection of Shiga toxin in human stool specimens.

In March 2000, to better understand laboratory-testing practices, the Connecticut Emerging Infections Program, Foodborne Diseases Active Surveillance Network surveyed all 40 Connecticut laboratories that perform bacterial culturing of stool specimens. Data collected included non-culture based methods for identifying STEC.

Of the 36 (90%) laboratories that returned a completed questionnaire, 22 (61%) routinely tested all stools for *E. coli* O157. When specifically requested by a physician, all laboratories tested for *E. coli* O157. Three laboratories initiated EIA for detecting Shiga toxin from stool specimens between 1998 and 1999. Three additional laboratories began Shiga toxin testing in 2000. Only one laboratory subsequently cultured positive EIA broths.

To determine which strains of STEC may be causing illness in Connecticut, Shiga toxin-related disease was added to the list of laboratory reportable diseases in 2000. Laboratories are required to send Shiga toxin positive broth to the State Laboratory for confirmation and identification of the causative organism.

The Centers for Disease Control and Prevention assists state laboratories by serotyping Shiga toxin-producing non-O157 isolates. Serotyping is important in determining which serotypes are pathogenic in humans, defining the epidemiology of these infections, and detecting outbreaks. Thus far during 2000, 84 *E. coli* O157 and 12 non-O157 STECs have been isolated from Connecticut residents.

Editorial

Testing trends in Connecticut indicate that Shiga toxin testing for *E. coli* is increasing and was used on an estimated 30% of specimens submitted for bacterial testing in 2000.

Health care providers evaluating patients with diarrhea (especially bloody diarrhea) or HUS should consider infection with non-O157 STEC. Specimens from patients with bloody diarrhea or HUS should be tested for Shiga toxin, either initially or if stool cultures are negative for *Shigella*, *Salmonella, Campylobacter*, and *E. coli* O157. A small number of persons have developed HUS after a urinary tract infection with either O157 or non-O157 STEC strains; in these cases, urine culture has yielded the pathogen when the stool culture was negative (2).

References

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In this issue...

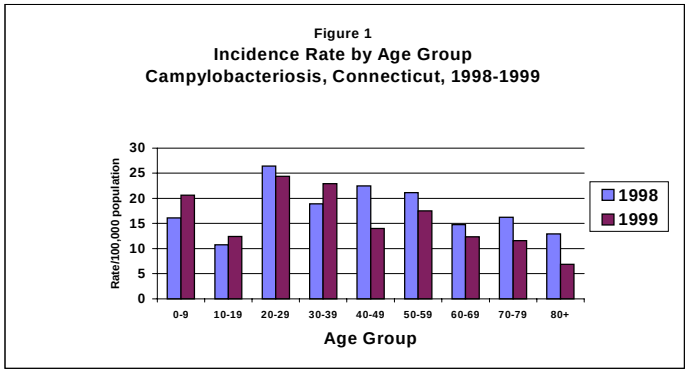
Campylobacteriosis Connecticut 1998, 1999

Campylobacter is the most commonly recognized cause of bacterial gastroenteritis in the United States (US), and the most common bacterial foodborne pathogen reported in Connecticut. Intestinal illness due to *Campylobacter* is one of the diseases targeted for intensive surveillance in the Connecticut Emerging Infections Program, Foodborne Diseases Active Surveillance Network. The following summarizes *Campylobacter* surveillance efforts for 1998 and 1999.

Surveillance Data

From January 1998 through December 1999, 1,167 cases of campylobacteriosis were reported to the Department of Public Health: 603 in 1998 and 564 in 1999. The average annual incidence rate was 17.8 cases per 100,000 population. Rates varied by county with the highest average annual rate reported in Fairfield County residents (23.6 cases per 100,000).

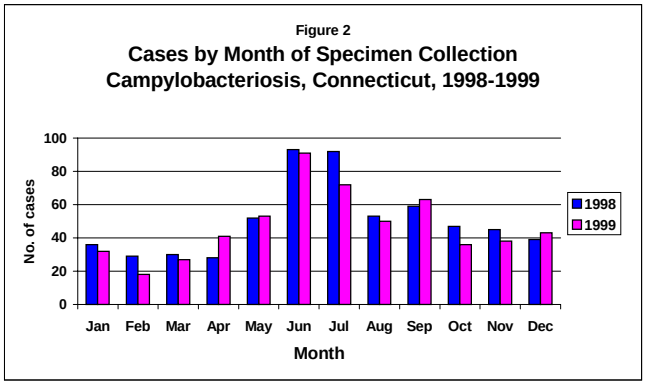
Infection rates were higher among males (19.6 cases per 100,000) than females (16.1 cases per 100,000) and varied by age group. Rates were highest in persons aged 20-29 years (Figure 1).



Information on ethnicity was available for 540 (46%) cases: 72 (13%) were Hispanic and 468 (87%) were non-Hispanic. Among the 586 cases with a known race, 526 (90%) were white, 34 (6%) black, 24 (4%) Asian, and 2 (<1%) native American.

Information on hospitalization was obtained for 906 (78%) cases. Of these, 142 (16%) were hospitalized; no deaths were reported.

The distribution of cases showed a seasonal variation with 451 cases (39%) occurring from June through August (Figure 2).



Campylobacter Case-Control Study

In 1998, all persons with laboratory-confirmed *Campylobacter* infection from Fairfield, Hartford, and New Haven counties participated in a case-control study to identify risk factors for campylobacteriosis. A total of 280 case and 280 age-group matched controls participated.

In univariate, matched analysis, the risk factor most strongly associated with illness was traveling outside the US in the 7 days before symptom onset (matched odds ratio (MOR) =11.3; p <. 0001).

When persons who traveled were excluded from the analysis, consumption of the following poultry products was associated with illness: eating chicken in a commercial establishment; eating pink chicken; and eating runny eggs. Other risk factors traditionally associated with infection included eating non-poultry meat at a commercial establishment, contact with a kitten, or contact with a puppy (Table 1).

Table 1: Risk factors for campylobacteriosis in non-travelers in Connecticut, 1998.

Risk Factor	Cases	Controls	MOR	P-value
Chicken in a restaurant	43%	21%	3.1	<.0001
Pink chicken	5%	2%	4.3	<.02
Runny eggs	21%	14%	1.8	<.03
Non-poultry meat at reastaurant	48%	38%	1.6	<.01
Kitten contact	5%	3%	5.0	<.04
Puppy contact	9%	4%	2.7	<.02

Campylobacter Antimicrobial Resistance

Antibiotic-resistant *Campylobacter* is increasing in the US (1). In particular, there has been a rise in resistance to fluoroquinolones, such as ciprofloxacin, which has coincided with their use in poultry feed. Fluoroquinolones were first licensed for use in the US poultry industry in 1995. In clinical practice, the emergence of fluoroquinolone-resistant *Campylobacter* during fluoroquinolone treatment has resulted in treatment failures (2,3).

In 1998, to monitor fluoroquinolone resistance, any *Campylobacter* isolate from a Connecticut resident was sent to the State Laboratory. All isolates were speciated and tested for antimicrobial susceptibility to azithromycin, chloramphenicol, ciprofloxacin, clindamycin, erythromycin, gentamicin, naladixic acid, and tetracycline using the E-test.

Antimicrobial susceptibility testing was completed on 391 (65%) isolates. Of the 391 tested, 217 (55%) were resistant to one or more antimicrobial agents, and 71 (18%) were resistant to two or more agents.

Resistance was most common to tetracycline (47%), naladixic acid (18%), and ciprofloxacin (16%). Ciprofloxacin-resistant isolates (n=61) were more likely to be resistant to chloramphenicol and clindamycin than ciprofloxacin-sensitive isolates, although co-resistance levels were generally low (Table 1).

Table 1: Resistance to selected antibiotics by ciprofloxacin-resistance status, Connecticut, 1998.

Antibiotic	Ciprofloxacin-sensitive (n=330)	Ciprofloxacin-resistant (n=61)	p-value*
Naladixic Acid	4%	100%	$<10^{-7}$
Tetracycline	46%	56%	NS
Chloramphenicol	1%	7%	.01
Clindamycin	<1%	3%	.04
Erythromycin	<1%	2%	NS
Azithromycin	0%	2%	NS
Gentamicin	0%	0%	NS

Eighty-four percent (163/193) of *Campylobacter* cases reported taking a physician-prescribed antibiotic for their illness. Ciprofloxacin was the most commonly prescribed antibiotic among adults (>17 years). Overall, 55% (89/163) reported taking ciprofloxacin for their illness: 53% (10/19) with ciprofloxacin-resistance and 55% (79/144) with ciprofloxacin-sensitive infections.

Editorial

Campylobacteriosis is the most commonly reported bacterial foodborne illness in Connecticut. Persons with a recent history of foreign travel are particularly likely to have a *Campylobacter* infection, but most cases are domestically acquired. Among non-travelers, eating poultry products in commercial establishments such as restaurants is the most important factor associated with infection.

Although eating undercooked chicken is a factor, cross-contamination from raw chicken to other foods during preparation is likely to be a major contributor to the risk of *Campylobacter* infection (4-8). While education and training of food workers are critical to reduce the risk, use of poultry that has gone through "cold pasteurization" methods (irradiation) after slaughter will virtually eliminate introduction into kitchens of pathogens such as *Campylobacter* and *Salmonella* and minimize problems from undercooking.

Several food irradiation methods for poultry (gamma rays, electron beams, x-rays) were approved by the Food and Drug Administration in the last decade. Establishments such as hospitals, long-term care facilities, catering services, and restaurants that handle a large volume of food and serve many persons at high risk for complications should strongly consider using cold-pasteurized poultry to reduce the risk of bacterial foodborne infections from poultry.

Ciprofloxacin–resistant *Campylobacter* infection is well established in Connecticut and may have important implications for treatment. Fluoroquinolones shorten the duration and severity of symptoms caused by *Campylobacter* gastroenteritis (1). Our data indicate that ciprofloxacin is frequently prescribed to treat *Campylobacter* infections in Connecticut; 84% of *Campylobacter* cases reported being prescribed an antibiotic for their diarrhea with 55% receiving ciprofloxacin. These data raise concern about the

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possible over-prescribing of antibiotics for a self-limited diarrheal illness. To prevent further emergence of antimicrobial resistant pathogens, consideration should be given to limiting antibiotic treatment to only severely ill patients or those with underlying health problems.

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The Department of Public Health, Infectious Diseases Division, Wishes You and Your Family a Very Safe and Happy Holiday Season.

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