

CAMPY SEASON

SINCE THE LATE 1970s, the curved or spiral Gram-negative bacillus known as *Campylobacter* has been recognized in many countries (including the United States) as the most common cause of bacterial gastroenteritis, occurring much more frequently than do infections caused by *Salmonella*, *Shigella*, or *Escherichia coli* O157. An estimated 2.4 million *Campylobacter* infections and 124 related deaths occur annually in the United States.¹ The Foodborne Illness Active Surveillance Network (“Food-Net”), a collaborative effort among CDC and several state health departments including Oregon’s, recently completed a large case-control study to try to understand where all this illness is coming from. This issue of the *CD Summary* reviews the epidemiology of this under-respected infection.

THE ANGUISH

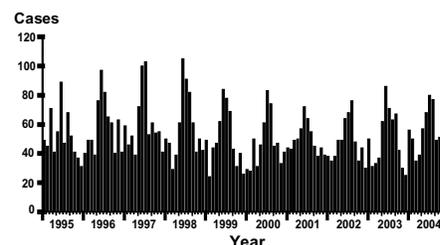
Usually around 2–5 (range, 1–10) days after ingesting the organisms, humans typically develop symptoms of diarrhea, fever, and abdominal cramps. Such illness is generally self-limited, and antibiotics are not indicated. But campylobacteriosis is not always benign. The Guillain-Barré syndrome, a (typically ascending) paralysis associated with demyelinating polyneuropathy, can ensue about 1–3 weeks after diarrhea illness; 30%–40% of patients with Guillain-Barré syndrome have evidence of antecedent *Campylobacter* infection.² Conversely, out of 737 lab-confirmed cases of Campy reported in Oregon in 1997, 3 (0.4%) went on to develop Guillain-Barré syndrome.³ Reactive arthritis is another potential sequela. In a recent survey, 83 (16%) of 513 Oregonians with recent culture-confirmed *Campylobacter* infection reported new onset of musculoskeletal symptoms suggesting possible reactive arthritis; a majority of these had objective findings of enthesopathy—i.e.,

inflammation at tendon insertion sites.⁴ All in all, Campy ends up being an expensive disease: in 1997 the USDA estimated its annual cost in the U.S. at \$1.5–\$8.0 billion.⁵

CAMPY EPIDEMIOLOGY

Although 14 species of *Campylobacter* have been identified, *C. jejuni* has accounted for >99% of reported human isolates in the United States. The incidence of *Campylobacter* infection shows a bimodal pattern by age group, with rates highest in the 1–4 year and 20–29 year age groups. Males consistently have higher rates than females.⁶ Campy has a distinct seasonality, with cases predictably at their peak right about this time of year (figure).

Reported Campylobacteriosis by Month, Oregon, 1995–2004



WHERE'S IT COMING FROM?

Campylobacter spp. are found in a variety of animals, including poultry, cattle, puppies, kittens, swine, sheep and birds. Transmission is ultimately fecal-oral, generally through contact with infected animals or ingestion of contaminated food or water. Notable among outbreaks of *Campylobacter* infection have been unpasteurized milk, undercooked poultry, and improperly treated surface water.^{7,8} If your child’s class is going on a field trip to visit a dairy, make sure that no one gets the bright idea of serving them some unpasteurized milk: a 10-year review of outbreaks in the United States found by 20 outbreaks of *Campylobacter* enteritis associated with drinking raw milk during youth activities; 15 of these were school field trips to dairy farms.⁸

Outbreaks of Campy, however, are relatively uncommon (or at least we don’t often recognize them): during 2000–2004, we logged just 4 Campy outbreaks in Oregon—compared to 12 featuring *E. coli* O157, 59 with *Salmonella*, and 258 of infection by Norwalk-like viruses. The vast majority of *Campylobacter* infections are “sporadic”—i.e., not part of recognized clusters that allow investigators to triangulate to a single source. Case-control studies in several countries have attempted to identify sources of infection for these sporadic cases; they have implicated consumption of poultry, transmission from pets and other animals, consumption of raw milk, and contaminated drinking water.^{9–12} Handling raw chicken may be particularly risky.¹³ The gut feeling that chicken and other poultry may be responsible for a lot of our Campy is reinforced by high rates of isolation of *Campylobacter* from retail chicken (47% of the chicken breasts cultured by the FDA in 2002 had the pathogen¹⁴); and the fact that the average American eats about 100 pounds of chicken per year.¹⁵

The largest epidemiologic study attempting to tease out the sources of Campy was a recently published, population-based, case-control study, conducted in FoodNet sites, that enrolled 1,316 cases and 1,316 controls. In a multivariate analysis, a handful of risk factors were significantly associated with *Campylobacter* infection (table, *verso*). Foreign travel accounted for about 12% of cases. Among those who had apparently acquired their infections in the U.S., eating chicken prepared at a restaurant appeared to account for the most cases—24%.* Eating non-poultry meat prepared at a restaurant appeared to account for 21% of the case load.¹⁶

* For you epidemiology geeks, this is the “population attributable fraction.”

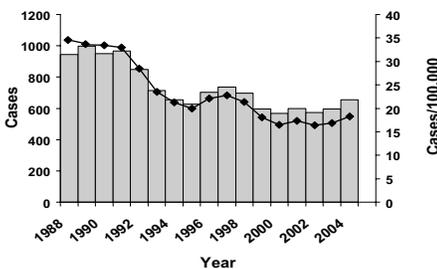


If you need this material in an alternate format, call us at 503/731-4024.

IF YOU WOULD PREFER to have your CD Summary delivered by e-mail, zap your request to cd.summary@state.or.us. Please include your full name and mailing address (not just your e-mail address), so that we can effectively purge you from our print mailing list, thus saving trees, taxpayer dollars, postal worker injuries, etc.

The incidence of culture-confirmed Campy as measured in FoodNet was 12.9 per 100,000—down 31% in 2004 compared to the 1996–1998 baseline, and approaching the 2010 national health objective of 12.3 per 100,000.¹⁷ Oregon has also enjoyed declines—although our incidence has been flat since about 1999 (figure). We fancy that the decline in incidence reflects efforts to reduce contamination of poultry, along with education of consumers about safe food-handling practices.

Campylobacteriosis Cases and Incidence, Oregon, 1988–2004



TREATMENT AND PREVENTION

In general, antibiotics are not needed for *Campylobacter* enteritis; maintenance of hydration and electrolyte balance is the cornerstone of treatment. Nevertheless, antibiotics should probably be used in the setting of high fever, bloody stools, prolonged illness, pregnancy, infection with HIV, and other immunocompromised states.¹⁸

Although infected persons may shed the organism for up to 7 weeks, person-to-person transmission of *C. jejuni* is unusual; but it seems prudent to advise anyone with an acute diarrheal illness against handling food for others until their illness resolves. Of course, all

Risk factors for campylobacteriosis¹⁷

Exposure	Odds Ratio (95% CI)
Ate chicken prepared at a restaurant	2.2 (1.7-2.9)
Ate non-poultry meat prepared at a restaurant	1.7 (1.3-2.2)
Had contact with animal stool	1.4 (1.02-1.9)
Had pet puppy	3.4 (1.8-6.5)
Had contact with farm animals (for persons age ≥12 years)	2.0 (1.2-3.6)
Ate turkey prepared at a restaurant	2.5 (1.3-4.7)
Drank untreated water from a lake, river, or stream	3.3 (1.5-7.5)
Ate undercooked or pink chicken	2.1 (1.2-3.4)
Ate raw seafood	1.9 (1.1-3.4)
Had contact with farm animals (for persons age 2–11 years)	1.0 (2.5-178)
Drank raw milk	4.3 (1.3-14.2)

persons should wash their hands after using the bathroom or touching animals; and drinking unpasteurized milk presents risks for campylobacteriosis and worse.

REFERENCES

- Mead PS, Slutsker L, Dietz V, et al. Food-related illness and death in the United States. *Emerg Infect Dis* 1999;5:607–25.
- Nachamkin I, Allos BM, Ho T. *Campylobacter* species and Guillain-Barré syndrome. *Clin Microbiol Rev* 1998;11:555–67.
- Shiferaw B, Steingraber K, Chapin W, et al. Surveillance for Guillain-Barré syndrome in Oregon [abstract]. In: International Conference on Emerging Infectious Diseases 2002: Program and Abstracts Book. Atlanta: CDC; 2002. p. 95.
- Townes JM, Thompson M, Barkhuizen A, Sobel J, Wagner M, Deodhar AA. Incidence of reactive arthritis and other musculoskeletal sequelae of enteric bacterial infection in Oregon: a population-based study [abstract OP0157]. In: Annual European Congress of Rheumatology (EULAR) Available at <http://mc.manuscriptcentral.com/cegi-bin/mc/printabsp?APP=eular2004SCIE-abstract&TEMPLATE=&keyf=1013&showHide=show&client=2004>.
- Buzby JC, Roberts T, Allos BM. Estimated annual costs of *Campylobacter*-associated Guillain-Barré syndrome. Washington, D.C.: U.S. Dept. of Agriculture Economic Research Service; 1997. Report No.: Agricultural Economics Report No. (AER756).
- Samuel MC, Vugia DJ, Shallow S, et al. Epidemiology of sporadic *Campylobacter* infection in the United States and declining trend in incidence. *FoodNet 1996-1999*. *Clin Infect Dis* 2004;38 Suppl 3:S165–74.
- Istre GR, Blaser MJ, Shillam P, Hopkins RS. *Campylobacter* enteritis associated with undercooked barbecued chicken. *Am J Public Health* 1984;74:1265–7.

- Wood RC, MacDonald KL, Osterholm MT. *Campylobacter* enteritis outbreaks associated with drinking raw milk during youth activities: a 10-year review of outbreaks in the United States. *JAMA* 1992;268:3228–30.
- Neimann J, Engberg J, Mølbak K, Wegener HC. A case-control study of risk factors for sporadic *Campylobacter* infections in Denmark. *Epidemiol Infect* 2003;130:353–66.
- Harris NV, Weiss NV, Nolan CM. The role of poultry and meats in the etiology of *Campylobacter jejuni/coli* enteritis. *Am J Public Health* 1986;76:407–11.
- Kapperud G, Espeland G, Wahl E, et al. Factors associated with increased and decreased risk of *Campylobacter* infection: a prospective case-control study in Norway. *Am J Epidemiol* 2003;158:234–42.
- Salfield NJ, Pugh EJ. *Campylobacter* enteritis in young children living in households with puppies. *Br Med J* 1987;294:21–2.
- Hopkins RS, Scott AS. Handling raw chicken as a source for sporadic *Campylobacter jejuni* infections [letter]. *J Infect Dis* 1983;148:770.
- FDA Center for Veterinary Medicine. 2002 Retail Meat Annual Report. Available at http://www.fda.gov/cvm/2002_RetailMeatRpt.htm.
- USDA National Agricultural Statistics Service. USDA-NASS Agricultural Statistics 2005. Available at www.usda.gov/nass/pubs/agr05/05_ch8.pdf.
- Friedman CR, Hoekstra RM, Samuel M, et al. Risk factors for sporadic *Campylobacter* infection in the United States: A case-control study in FoodNet sites. *Clin Infect Dis* 2004;38 Suppl 3:S285–96.
- CDC. Preliminary FoodNet Data on the incidence of infection with pathogens transmitted commonly through food—10 sites. United States, 2004. *MMWR* 2005;54:352–6.
- Allos BM. *Campylobacter jejuni* Infections: update on emerging issues and trends. *Clin Infect Dis* 2001;32:1201–6.