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Burden and Trends in *Campylobacter*

Campylobacter is a common bacterial pathogen in the United States; it is estimated that there are 2.5 million infections every year resulting in 13,000 hospitalizations and 124 deaths[1]. Persons with *Campylobacter* typically experience fever, abdominal cramps and diarrhea which may be bloody. Although most persons recover in about a week, persons with weakened immune systems may suffer complications such as a bloodstream infection or Guillan-Barre syndrome (a temporary paralysis that can last several weeks and usually requires intensive care). Anyone can get a *Campylobacter* infection, but children <5 years and young adults are known to be at a higher risk; males are more likely to become infected than females. Although there are many species of *Campylobacter*, the majority of human illness is caused by *Campylobacter jejuni* and most cases occur in the summer months. *Campylobacter* is spread through the consumption of contaminated food (typically poultry), water or contact with infected animals (particularly cats and puppies). Illness usually occurs 2-5 days after exposure. Outbreaks of *Campylobacter* are rare; however, many outbreaks are caused by the consumption of unpasteurized milk.

Campylobacter infections are not nationally notifiable, and prior to the establishment of FoodNet in 1996, there were no precise estimates of the burden of this important pathogen in the U.S. Using data from FoodNet, national goals were established for a 50% reduction in the 1996 incidence of infections by 2010 (goal of 12.3 cases per 100,000 persons[3]).We are close to meeting this goal; compared to a baseline period of 1996-1998, the incidence of *Campylobacter* has declined by 30%. In 2006, the incidence was 12.7 per 100,000 persons, with the highest rate in California and lowest in Tennessee[2]. Several efforts are underway in FoodNet to attempt to explain these regional differences in *Campylobacter* rates; including a survey of clinical laboratories regarding testing practices, and testing of poultry meat from retail stores. FoodNet has also conducted two case-control studies to help understand risk factors for sporadic disease (see summary of Sporadic Campylobacter Infections in Infants on pg. 2)

Continued active surveillance coupled with the work of partner agencies to understand the rates of contamination on meat and poultry products will help us to gain a better understanding of the overall burden of *Campylobacter* and enable the implementation of effect prevention and control measures. For more information on *Campylobacter*, visit: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/campylobacter_g.htm.

—Mary Patrick, CDC FoodNet

[1]Mead et al. Food-Related Illness and Death in the United States. EID Vol 5, Sep 1999.

[2]Preliminary FoodNet Data on the Incidence of Infection with Pathogens Transmitted Commonly Through Food — 10 States, 2006. MMWR. April 13, 2007 / 56(14);336-339.

[3] http://www.cdc.gov/nchs/about/otheract/hpdata2010/abouthp.htm

WHAT IS FOODNET?

The Foodborne Diseases Active Surveillance Network (FoodNet) is the principal foodborne disease component of CDC's Emerging Infections Program. FoodNet is a collaborative project of the CDC, ten sites (CA, CO, CT, GA, MD, MN, NM, NY, OR, TN), the U.S. Department of Agriculture (USDA), and the Food and Drug Administration (FDA).

Centers for Disease Control and Prevention
1600 Clifton Road NE,
MS D-63
Atlanta, Georgia 30333

STATE SPOTLIGHT: GUILLAIN-BARRÉ IN OREGON

Hospital discharge data from 1997 and 2003 were used to determine the burden and the proportion of Guillain-Barré Syndrome (GBS) and the proportion attributable to campylobacteriosis in Oregon. *Campylobacter* associated cases decreased from 1997 to 2003 (7% vs. 3%). The average incidence of GBS was 1.25/100,000. The incidence of GBS decreased corresponding to the decline in campylobacteriosis[1].

—Beletshachew Shiferaw, Oregon FoodNet

[1]Shiferaw et al. Use of Hospital Discharge Data to Assess the Incidence of Guillain-Barré Syndrome. Submitted to Neuroepidemiology, Fall 2007.

Sporadic *Campylobacter* Infection in Infants

Infants have a higher risk of catching foodborne illness than older children or adults. However, findings from a recent study[1] conducted by FoodNet describe several ways to reduce your infant's risk of contracting the most common bacterial foodborne illness in the United States.

Campylobacter infection has been linked to the consumption of unpasteurized (raw) milk and poultry, untreated water, contact with pets, especially those with diarrhea, and exposure to farms or farm animals. However, because of their limited diets and behavioral factors such as frequent hand-to-mouth contact, the sources of infection among infants may differ from those of older age groups.

FoodNet conducted a study of sporadic (non-outbreak) laboratory-confirmed *Campylobacter* cases occurring in children under the age of one year to investigate the potential sources of infection in infants residing in Connecticut, Minnesota, Oregon, and selected counties in California, Colorado, Georgia, New York and Tennessee. The study area covered a population of approximately 35.2 million persons (12.1% of the U.S. population), including approximately 450,000 infants.

The study involved 123 infants infected with *Campylobacter* and 928 healthy infants. Parents or guardians were interviewed by telephone about various environmental and dietary exposures the infant may have had in the five days before illness or interview.

When compared to healthy infants of the same age, infants 0-6 months old with *Campylobacter* infection were less likely to have been breastfed, and more likely to have drunk well water or to have ridden in a shopping cart next to meat or poultry in the five-days before illness or interview. For infants 7-11 months old, infants with *Campylobacter* infection were more likely to have visited or lived on a farm, to have contact with a pet with diarrhea in the home, and to have eaten fruits and vegetables prepared in the home. *Campylobacter* infection was associated with travel outside the U.S. in infants of all ages, though international travel was uncommon, suggesting that most infections in infants in the U.S. are acquired domestically[1].

—Bridget Anderson, New York FoodNet

[1]Summary of Fullerton et al. Sporadic *Campylobacter* Infections in Infants: A Population-Based Surveillance Case-Control Study in Eight FoodNet Sites. PIDJ; 2007 Vol 26(1): 19-24.

CAMPYLOBACTER: STRATEGIES FOR PREVENTION

- For young infants, breastfeeding is the best way to prevent illness and is encouraged for this and a variety of health reasons.
- Frequently wash your hands with soap and warm water or using an alcohol-based hand sanitizer, but especially before preparing food or bottles for infants.
- Pacifiers, teething rings and toys that fall to the floor should be cleaned with soap and water.
- Purified water should be used for drinking, brushing teeth, and mixing infant formula and foods.
- Fresh fruits and vegetables should be cooked or washed well and peeled before eating.
- Use a disinfecting hand wipe to clean parts of shopping carts an infant may touch and place raw meat and chicken out of reach of infants.
- For more information regarding *Campylobacter* infection, please contact your local health department or visit the CDC website at www.cdc.gov.

FSIS Helps Consumers Be Food Safe

The United States Department of Agriculture's Food Safety and Inspection Service (FSIS) helps to educate consumers on safe food handling practices to protect them from contracting a foodborne illness. Through its national consumer-oriented campaigns and programs, such as *Be Food Safe* and *Is It Done Yet?*, FSIS promotes the science-based and simple messages of Clean, Separate, Cook and Chill developed by the Partnership for Food Safety Education to help consumers prevent foodborne illness.

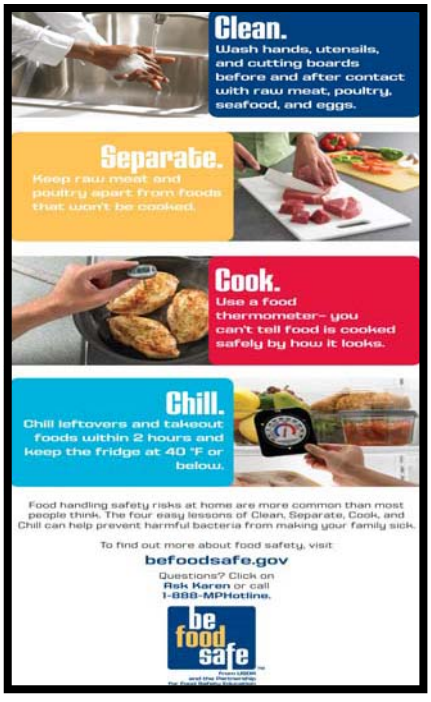
- ***Clean**: Wash hands and surfaces often*
- ***Separate**: Don't cross-contaminate*
- ***Cook**: Cook to proper temperature*
- ***Chill**: Refrigerate promptly*

With the holiday season quickly approaching, knowing how to prepare your meat, poultry, and egg products safely is critical to helping you be food safe. Science tells us that *Campylobacter* and *Salmonella*, prevalent foodborne pathogens found in poultry, are easily destroyed by cooking all poultry to a safe minimum internal temperature of 165˚F. FSIS recommends that a food thermometer be inserted in the thickest areas of the product without touching bone, to ensure the product is cooked to a safe minimum internal temperature. For whole turkey, check the internal temperature in the innermost part of the thigh and wing and in the thickest part of the breast.

Additionally, FSIS encourages you to access its virtual food safety representative, *Ask Karen*, available 24/7, at www.AskKaren.gov, its Web site at http://www.fsis.usda.gov/Fact_Sheets, or call its Meat and Poultry Hotline at 1-888-MPHotline (1-888-674-6854) Monday through Friday from 10A to 4P, excluding all holidays, except Thanksgiving Day, when it is available 8AM to 2PM.

Accessing and applying this valuable safe food handling information will help you to prepare your meat, poultry, and egg products safely; thus, helping you be food safe all year round.

—Janice Adams King, USDA-FSIS



FSIS: A Team Player in Preventing Foodborne Illness

Like a first down, enforcing regulations, identifying and implementing science-based strategies to keep our food safe, and educating the public about foodborne illness and safe food handling behaviors is an ongoing process in helping us score a touchdown – hence, achieving the goal of reducing pathogens in foods and preventing foodborne illness.

The United States Department of Agriculture's Food Safety and Inspection Service (FSIS) ensures that meat, poultry, and egg products sold in interstate commerce are safe, wholesome, and correctly labeled and packaged. FSIS enforces food safety laws, regulations, policies, and programs year-round to reduce pathogens in meat, poultry, and egg products.

Never working in isolation, and always part of a team, FSIS partners with the food industry, state and other federal agencies, and academia to better understand existing and emerging foodborne pathogens, develop and implement food safety campaigns and educational initiatives, as well as programs, policies and procedures, such as the Hazard Analysis and Critical Control Point (HACCP) system and laboratory testing programs to help ensure the safety of its regulated products.

Recognizing that poultry can be contaminated with *Campylobacter* and that this pathogen presents public health challenges, FSIS sought advice from the National Advisory Committee on Microbiological Criteria for Foods (NACMCF) on the applicability of various *Campylobacter* food testing methodologies. FSIS used the NACMCF recommendations (http://www.fsis.usda.gov/About_FSIS/NACMCF/index.asp) as the basis of the new FSIS broiler and turkey baseline studies underway in the fall of 2007. These baseline studies will help establish a microbiological performance standard for *Campylobacter*.

FSIS is working very hard to ensure that the industry is effectively addressing the occurrence of *Salmonella* on poultry products. Many of the interventions that are effective against *Salmonella* are also effective against *Campylobacter*. This effort has undoubtedly contributed to the reduction in human illnesses attributable to *Campylobacter*.

For more information about the work of FSIS, visit: http://www.fsis.usda.gov/.

—Janice Adams-King, USDA-FSIS

Spotlight on Antibiotic Resistance

Campylobacter is the most common cause of bacterial gastroenteritis in the U.S., causing approximately 2.5 million infections each year[1,2]. Although most infections are self-limited, characterized by diarrhea, fever, and abdominal cramps, antimicrobial treatment is essential for severe illness. Ciprofloxacin, a fluoroquinolone, is one of the most common antimicrobial agents prescribed for treatment of *Campylobacter* infections in humans[1,3]. Poultry is a major source of human *Campylobacter* infections and has been identified as a possible reservoir for antimicrobial-resistant infections[2]. *Campylobacter* surveillance was initiated in FoodNet as a part of the National Antimicrobial Resistance Monitoring System (NARMS) in 1997. NARMS tests a proportion of *Campylobacter* isolates obtained from FoodNet sites for resistance to common antimicrobial agents, including fluoroquinolones. The prevalence of ciprofloxacin-resistant *Campylobacter* increased from 13% (28/217) in 1997 to 19% (66/347) in 2004[4]. In the U.S. fluoroquinolones were approved for use in poultry in 1995[2]. In 2000, prompted by surveillance data from FoodNet and NARMS, FDA began steps to withdrawal the use of fluoroquinolones in poultry. Following a series of legal hearings, the FDA commissioner prohibited the use of the fluoroquinolone, enrofloxacin, in poultry[1]. Antimicrobial resistance surveillance continues to emphasize the importance of judicious use of antimicrobial agents in food animals.

—Sharon Greene, CDC NARMS

[1]Nelson JM, Chiller TM, Powers JH, Angulo FJ. 2007. Fluoroquinolone-Resistant *Campylobacter* Species and the Withdrawl of Fluorquinolones from Use in Poultry: A Public Health Success Story. CID 44:977-980; [2]Smith KE, BesserJM, Hedberg CW, Leano FT, Bender JB, Wicklund JH. 1999. Quinolone-Resistant *Campylobacter jejuni* infections is Minnesota, 1992-1998. N Engl J Med 340(20): 1525-1532; [3]Gupta A, Nelson HM, Barrett TJ, Tauxe RV, Rossiter SP, Friedman CR. 2004. Antimicrobial resistance among *Campylobacter* strains, United States. 1997-2001. EID 10(6): 1102-1109; [4]Centers for Disease Control and Prevention. 2007. National Antimicrobial Resistance Monitoring System (NARMS): Human Isolates Final Report, 2004. Atlanta, Georgia: U.S. Department of Health and Human Services.

Campylobacter Outbreaks

Outbreaks of *Campylobacter* are rare. Only 23 outbreaks of *Campylobacter* were reported from FoodNet sites between 2000 and 2006. Of 17, 142 cases reported to FoodNet (2004-2006), only 82 (0.5%) were outbreak-associated. The following abstract describes a recent outbreak of *Campylobacter* that was linked to contamination of a municipal water source.

Background: The implementation of treated municipal water systems in the 20th century led to a dramatic decrease in waterborne disease in the United States. However, communities with deficient water systems still experience waterborne outbreaks. In August 2004, we investigated an outbreak of gastroenteritis on South Bass Island, Ohio, an island of 900 residents that is visited by >500,000 persons each year.

Methods: To identify the sources of illness, we conducted a case-control study and an environmental investigation. A case was defined as diarrhea in a person who traveled to the island during the period from May 1 through September 30, 2004 and became ill within 2 weeks after the visit. Healthy travel companions served as matched control subjects. We also performed an environmental assessment and extensive testing of island water sources.

Results: Among the 1450 persons reporting illness, *Campylobacter jejuni*, norovirus, *Giardia intestinalis*, and *Salmonella enterica* serotype Typhimurium were identified in 16, 9, 3, and 1 persons, respectively. We interviewed 100 case patients and 117 matched control subjects. Case patients were more likely to drink water on the island than control subjects (68% vs. 35%; matched odds ratio, 4.3; 95% confidence interval, 2.2-9.3). Sampling of ground water wells indicated contamination with multiple fecal microbes, including *Escherichia coli*, *C. jejuni*, *Salmonella* species, and *Giardia* species. Irregularities in sewage disposal practices that could have contaminated the underground aquifer were noted.

Conclusions: The combined epidemiological and environmental investigation indicated that sewage-contaminated ground water was the likely sources of this large outbreak. Long-term changes to the island's water supply and sewage management infrastructure are needed.[1]

-Abstract by Ciarra O'Reilly et al.

[1]O'Reilly et al. A Waterborne Outbreak of Gastroenteritis with Multiple Etiologies Among Resort Island Visitors and Residents: Ohio 2004. CID 2007; Vol 44(4): 506-512.

CHRO Update

The 14th International Workshop on *Campylobacter, Helicobacter* and Related Organisms (CHRO 2007) was held in Rotterdam, the Netherlands, on September 2-5.

There were a number of presentations on multilocus sequence typing (MLST). In the United Kingdom, W. F. Sopwith et al. reported that sequence types (ST) ST-21, ST-257 and ST-45 were the most common clonal complexes in humans. N. French reported that the most common human STs in New Zealand (ST-474 and ST-190) are both are internationally rare and found almost exclusively in humans and poultry. A case-control study in England by C.C. Tam et al. found that, compared to those who normally consume chicken, non-habitual chicken eaters had a greater risk of infection when consuming commercially-prepared chicken in the previous five days.

A quantitative risk model for *C.* jejuni and *C.* coli developed by R. J. Lake et al. indicates that poultry is an important vehicle for campylobacteriosis transmission in New Zealand.

B. Borck *et al.* reported that a risk management strategy in Denmark has had a significant impact on the occurrence of *Campylobacter* in Danish broiler meat. The strategy focused on reducing infection at the farm level, reducing the concentration of *Campylobacter* on the chicken meat, and educating the consumers.

FoodNet presented three posters at the conference (see recently presented abstracts below). Pat McDermott from FDA gave an oral presentation on the NARMS Retail Foods Study. Conference abstracts are available at http://www.chro2007.nl/.

—Elaine Scallan, CDC FoodNet

Burden of Illness Update

The 4th Annual Meeting of the International Collaboration on Enteric Disease Burden of Illness Studies was held as a satellite meeting to CHRO 2007 on September 1-2. The second day of the meeting focused on *Campylobacter*.

Donald Campbell from the New Zealand Food Safety Authority presented New Zealand's strategy for the management of *Campylobacter*. Daniel Wilson from Lancaster University described the use of multilocus sequence typing (MLST) for tracing the sources of *C. jejuni* infection in the UK, indicating that the most sequence types in humans are from meat sources. Irving Nachamkin from the University of Pennsylvania gave an overview of Guillain-Barré Syndrome (GBS) and described patterns of GBS among children in Mexico. Approaches to estimating the burden of GBS attributable to Campylobacter were presented with examples from the United Kingdom and the Tennessee and Oregon FoodNet sites. The international collaboration will establish a working group to review methods to estimate the burden of GBS internationally. The International *Campylobacter* Laboratory Survey Working Group presented preliminary results from FoodNet sites, Canada and New Zealand.

For additional information or to join the International Collaboration please email: ICOFDN@lisrserv.cdc.gov.

—Elaine Scallan, CDC FoodNet

RECENTLY PRESENTED ABSTRACTS ON *CAMPYLOBACTER*

- L. Demma, *Campylobacter* species in FoodNet and NARMS 1997-1004: is the incidence of *Campylobacter coli* infection increasing?
- L. Demma, Clinical laboratory practices for the isolation and identification of *Campylobacter* in FoodNet sites and correlation with geographic variation.
- E. Ailes, Epidemiology and Trends in Incidence of Sporadic *Campylobacter* in the United States, FoodNet 1996-2006
- M. Patrick, Trends in incidence of *Campylobacter* infections: effect of age and gender, FoodNet, 1996-2006.

ADDITIONAL *CAMPYLOBACTER* RESOURCES

- http://www.fightbac.org
- http://www.fsis.usda.gov/Fact_Sheets/Campylobacter_Questions_and_Answers/index.asp
- http://www.cdc.gov/ncidod/dbmd/diseaseinfo/campylobacter_g.htm

For more information about this newsletter please contact: apotter@cdc.gov