

Foodborne Illnesses

PHYSICIANS COMMITTEE FOR RESPONSIBLE MEDICINE

5100 WISCONSIN AVE., N.W., SUITE 400 • WASHINGTON, DC 20016
PHONE (202) 686-2210 • FAX (202) 686-2216 • PCRM@PCRM.ORG • WWW.PCRM.ORG

Foodborne diseases are a serious and growing problem. Foodborne diseases cause an estimated 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United States each year. Experts estimate that the yearly cost of all foodborne diseases in this country is \$5 to \$6 billion in direct medical expenses and lost productivity. *Salmonella* infections alone account for \$1 billion yearly in direct and indirect medical costs.¹ However, many cases of foodborne illness go unreported.

From 1993–1997, 2,751 outbreaks involving 86,058 cases of food poisoning were reported to the Centers for Disease Control and Prevention (CDC). Bacterial pathogens caused 75 percent of the outbreaks and 86 percent of the cases. *Salmonella* caused most outbreaks, cases, and deaths, and most of these outbreaks were attributed to eating eggs.²

During the past twenty years, many previously unrecognized foodborne pathogens emerged, including *Campylobacter jejuni* (associated with poultry products), *Escherichia coli* O157:H7 (ground beef), and *Listeria monocytogenes* (dairy products). Other less common pathogens included *Bacillus cereus*, *Clostridium botulinum*, *Clostridium perfringens* (found in beef), *Shigella*, and *Staphylococcus aureus* (found in pork).³ Raw foods of animal origin are the most likely to be contaminated, such as raw meat and poultry, raw eggs, unpasteurized milk, and raw shellfish.⁴ In addition, treatment is more difficult due to an increase in antibiotic resistance among common foodborne pathogens.⁵

***Escherichia coli* O157:H7 Outbreaks**

In the early 1980s, *Escherichia coli* O157:H7 began causing severe foodborne-disease outbreaks. Before then, *E. coli* was considered a harmless inhabitant of the digestive tract of humans and animals. Today, the CDC estimates that there are 73,000 cases of *E. coli* O157:H7 infection and 61 deaths in the U.S. each year.⁶ Infection is most often associated with the consumption of contaminated ground beef but is also associated with unpasteurized milk and juice, packaged sprouts and lettuce, salami, and contaminated water. Infections are characterized by abdominal cramping and bloody diarrhea and can progress to the hemolytic uremic syndrome (HUS), leading to kidney failure and sometimes blindness.⁷ Death rates from HUS range from 3 to 5 percent, but can be much higher in elderly people and children.⁶ The infection can also lead to neurological disease, causing

seizures, comas, and cerebral blood clots, and can so severely damage the lining of the large intestine that it may have to be removed to save the patient. *E. coli* O157:H7 is a major cause of HUS in the United States, and HUS is most common cause of acute renal failure in children.

The overall trend of *E. coli* infections is difficult to determine due to under-reporting by physicians, but it is estimated to be increasing. The incidence of HUS, which can be used as a marker for *E. coli* infections, is definitely increasing in the United States.⁸

In July 2002, the presence of *E. coli* O157:H7 bacteria in ground beef products prompted one of the largest meat recalls in U.S. history.⁹ Thirty-eight people became ill, 11 were hospitalized, 6 developed hemolytic uremic syndrome, and 1 died.¹⁰

A 1987 study tested for the presence of *E. coli* O157:H7 in supermarket meats. The bacteria was found in 3.7 percent of beef, 1.5 percent of pork, 1.5 percent of chicken and turkey, and 2.0 percent of lamb samples tested. These researchers suggested that “the organism is not a rare contaminant of fresh meats and poultry.”¹¹

In 2002, the Food Safety and Inspection Service (FSIS) found *E. coli* O157:H7 in 13 out of 1,241 ground beef samples taken from retail stores.¹²

E. coli appears to be a common inhabitant of the bovine digestive tract. A study from 2001 found the organism in at least one animal from each of the 29 feedlot pens tested. *E. coli* O157:H7 was isolated from the feces of 23 percent of the cattle.¹³ The researchers suggested that “*E. coli* O157:H7 should be considered common to groups of feedlot cattle housed together in pens.”

Salmonella Outbreaks

Currently, about 40,000 cases of salmonellosis are reported to the CDC annually. These are associated with about 600 deaths. But the CDC estimates that the actual number of infections may be thirty times more or greater because many milder cases are not diagnosed or reported.¹⁴

Salmonella bacteria live in the intestinal tracts of humans and other animals. *Salmonella* is usually transmitted to humans from food contaminated with animal feces. Contaminated foods are usually of animal origin, such as meat, dairy and eggs. However, all foods, including vegetables, can become contaminated.¹⁴

Slaughter operations can spread contamination from one

carcass to another. After defeathering, chicken carcasses are plunged into chill tanks, which can become quite dirty by the end of the day. A 1990 article in *The Atlantic Monthly* notes that the debris at the bottom of the tank may be one foot deep, and quotes an inspector who complained, “At the beginning of the day the chill-tank water is clear and clean, but as the day goes on, it becomes murky, dirty-brownish, and bloody.”¹⁵

From 1998–2002, FSIS found salmonella in 10.9 percent of broilers analyzed. Also studied by FSIS were uncooked samples of ground beef (3.2 percent positive for salmonella), pork (4.7 percent), ground chicken (19.8 percent), and ground turkey (26.6 percent).¹⁶ These bacteria-infected samples were taken from products sold to consumers.

Other Foodborne Pathogens

Campylobacter is the second leading bacterial cause of diarrheal illness in the United States, according to the CDC. *Campylobacteriosis* is estimated to affect over 1 million people every year, and causes approximately 100 deaths. A very small number of *Campylobacter* organisms can cause illness in humans. Even one drop of juice from raw chicken meat can infect a person. This foodborne illness usually originates from poultry meat and unpasteurized milk or water that has been contaminated with the *Campylobacter* organism.¹⁷

Listeriosis is a serious infection caused by the bacteria *Listeria monocytogenes*. It primarily affects pregnant women, newborns, and adults with weakened immune systems. The CDC estimates that 2,500 people become seriously ill with listeriosis each year, and, of these, approximately 500 die.¹⁸ *L. monocytogenes* is most often found in hot dogs, luncheon meats, soft cheeses, and smoked seafood. It can also be found in unpasteurized milk and contaminated raw meat and vegetables.

Slaughterhouse Inspection

Since 1906, meat inspection has been limited to organoleptic methods, which rely on detecting changes in the sight, smell, or feel of the tissues. But this does not detect foodborne microorganisms. For the past several years, the National Academy of Sciences has recommended that a more complete inspection, which would include microbiological monitoring since many contaminants could be present in numbers high enough to cause disease without altering the sight, smell, or feel of the carcass, or even without causing visible disease in living cows, pigs, or chickens, be instituted.

FSIS reacted to foodborne outbreaks by instituting the Hazard Analysis and Critical Control Point program (HACCP) and began a microbiological baseline study of meat products called the Microbiological Baseline Data Collection Program. HACCP is a method of analysis designed to identify areas within the food processing chain where chemical or microbial contamination is likely to occur. Steps are then taken to alter the processing procedures

at key steps, called critical control points, so as to reduce the possibility of foodborne disease or spoilage. Monitoring of the control points is performed by physical, chemical, or microbiological tests. However, the program is useless if the government is unwilling to mandate changes in plant operations. Slaughter line speeds, for example, contribute to contamination and make inspection more difficult. Yet producers and government regulations continue to sidestep this problem because slowing the slaughter line reduces profits.

In an August 2002 report, the United States General Accounting Office “found that FSIS is not ensuring that all plants’ HACCP plans meet regulatory requirements. As a result, consumers may be unnecessarily exposed to unsafe foods than can cause foodborne illnesses.” In addition, this report states that “FSIS is not ensuring that plants take prompt and effective action to return to compliance after a HACCP violation has been identified.”¹⁹

In summary, microbial contamination of meat and poultry is a big problem, and it’s getting bigger. And with contaminated products in our kitchens and restaurants, cross-contamination and contagion will be increasing problems.

Cross-Contamination and Contagion: Persistent Dangers

Cross-contamination is a serious concern for the consumer, and its evaluation is critical in any discussion of meat safety. There are three ways people are exposed to pathogenic (disease-causing) bacteria. The first is through ingestion of contaminated products; the second through contact with persons already infected with the bacteria, which can be a particular problem in group settings such as nursing homes or day-care centers; and lastly, through ingestion of foods contaminated by contact with infected meat or contaminated utensils or kitchen surfaces.

Findings published in the February 1993 issue of the *Journal of the American Medical Association* described evidence of transmission of *E. coli* 0157:H7 from child to child in day-care centers, and suggested that household transmission may also occur.²⁰

Since both *E. coli* and *Shigella* require only a small number of organisms to cause disease, and the infectious dose of salmonella is often low,²¹ cross-contamination becomes a major threat, and one that widens the scope of susceptible persons beyond those who eat undercooked ground beef and unpasteurized milk.

Food Safety

There are two main sources of organisms that cause foodborne illness: (1) animal products tainted with fecal contamination during slaughter or processing and (2) foods that have been secondarily contaminated by animal products. A good solution to this problem is to eliminate animal products from the diet, and therefore remove the most common carrier of these bacteria.

In addition, basic food safety measures should be taken in the home:

- Wash hands thoroughly in hot soapy water before and after preparing food, before eating, and after using the bathroom, changing a diaper, or touching companion animals.
- Do not allow companion animals on kitchen counters or dining surfaces.
- Wash all fruits and vegetables under cool running tap water before preparing or consuming.
- Drink only pasteurized juices and treated water.
- Refrigerate leftovers promptly (within two hours).

Even if bacterial contamination could be eliminated, meat should still not be considered a safe food, due to the long-term risks posed by its cholesterol and fat content and its lack of fiber and complex carbohydrates. This combination is implicated in heart disease, various cancers, obesity, kidney disease, diabetes, hypertension, and other serious illnesses. Nonetheless, the acute risks of bacterial contamination are serious and often life-threatening and have not been adequately addressed by the U.S. Department of Agriculture.

PCRM Recommendations

- Federal authorities must set specific timetables and goals for dealing with food contaminants. To date, government efforts are inadequate.
- The USDA seal of approval, which reads, “Inspected for wholesomeness, USDA,” should be dropped until federal food inspection authorities have developed and implemented a workable detection method for microbial contaminants.
- Slaughter operations must have more inspectors, reduced line speeds, and comprehensive traceback systems that identify the sources of tainted meat. Federal authorities should begin the implementation of other recommendations already made by consumer groups to improve inspection procedures.
- The federal government must require meat producers to withdraw pathogen-tainted meat from routine consumer use. Otherwise, detection is useless to the consumer.
- Public education efforts must be stepped up to alert consumers to the risks from undercooked meat, cross-contamination, and contagion. Other consumer measures, such as simple cooking gauges on retail meat and poultry packages, should be considered.
- Information on plant contamination levels, compliance, violations, and recalls should be released to the public.
- Because the USDA has demonstrated that it is unable and unwilling to address food contamination issues, responsibility for food safety should be removed from them.

- Health professionals should become familiar with *E. coli* O157:H7 and the illnesses it can cause and should test for the organism in all persons with acute bloody diarrhea.
- State and federal regulations should require that *E. coli* O157:H7 infection and hemolytic uremic syndrome (HUS) be reported to public health officials.
- Imported meat should be subject to the same level of inspection as domestically produced meat.

References

1. National Institute of Allergy and Infectious Disease Health Matters Foodborne Diseases fact sheet (www.niaid.nih.gov/factsheets/foodbornedis.htm). Accessed September 2003.
2. Olsen SJ, MacKinnon LC, Goulding JS, Bean NH, Slutsker L. Surveillance for foodborne-disease outbreaks—United States, 1993–1997. *MMWR CDC Surveill Summ*. 2000 Mar 17;49(1):1-62.
3. Bean NH, Griffin PM. Foodborne disease outbreaks in the United States, 1973–1987: pathogens, vehicles, and trends. *J Food Protection* 1900;53(9):804-17.
4. CDC Division of Bacterial and Mycotic Diseases, Disease Information: Foodborne Illness (www.cdc.gov/ncidod/dbmd/diseaseinfo/foodbornedis.htm). Accessed September 2003.
5. Lasky T. Foodborne Illness—Old Problem, New Relevance. *Epidemiology* 2002 Sep; 13 (5): 593-8.
6. CDC Division of Bacterial and Mycotic Diseases, Disease Information: *Escherichia coli* O157:H7 (www.cdc.gov/ncidod/dbmd/diseaseinfo/escherichiacoli_g.htm). Accessed September 2003.
7. Potter ME. The changing face of foodborne disease. *JAVMA* 1992;201(2):250-3.
8. Martin DL, MacDonald KL, White KE, Soler JT, Osterholm MT. The epidemiology and clinical aspects of the hemolytic uremic syndrome in Minnesota. *N Eng J Med* 1990;323(17):1161-7.
9. MMWR Morb Mortal Wkly Rep. 2002 Jul 26; 51 (29): 637-9.
10. CDC Press Release (www.cdc.gov/od/oc/media/pressrel/b020813.htm). Accessed September 2003.
11. Doyle MP, Schoeni JL. Isolation of *Escherichia coli* O157:H7 from retail fresh meats and poultry. *Appl and Env Micro* 1987;53(10):2394-6.
12. Food Safety and Inspection Service, Electronic Reading Room: Microbiological Results of Raw Ground Beef Products Analyzed for *Escherichia coli* O157:H7 (www.fsis.usda.gov/OPHS/ecoltest/tables1.htm). Accessed September 2003.
13. Smith D, Blackford M, Younts S, Moxley R, Gray J, Hungerford L, Milton T, Klopfenstein T. Ecological relationships between the prevalence of cattle shedding *Escherichia coli* O157:H7 and characteristics of the cattle or conditions of the feedlot pen. *J Food Prot*. 2001 Dec;64(12):1899-903.
14. CDC Division of Bacterial and Mycotic Diseases, Disease Information: Salmonellosis (www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm). Accessed September 2003.
15. Dirty Chicken. *The Atlantic Monthly* November 1990;266(5):32.
16. FSIS, Progress Report on Salmonella Testing of Raw Meat and Poultry Products, 1998–2002 (www.fsis.usda.gov/OPHS/haccp/salm5year.pdf). Accessed September 2003.
17. CDC Division of Bacterial and Mycotic Diseases, Disease Information: *Campylobacter* Infections (www.cdc.gov/ncidod/dbmd/diseaseinfo/campylobacter_g.htm). Accessed September 2003.
18. CDC Division of Bacterial and Mycotic Diseases, Disease Information: Listeriosis (www.cdc.gov/ncidod/dbmd/diseaseinfo/listeriosis_g.htm). Accessed September 2003.
19. The United States General Accounting Office. Meat and Poultry: Better USDA Oversight and Enforcement of Safety Rules Needed to Reduce Risk of Foodborne Illnesses. GAO-02-902, August 30, 2002
20. Belongia EA, Osterholm MT, Soler JT, Ammend DA, Braun JE, MacDonald KL. Transmission of *Escherichia coli* O157:H7 infection in Minnesota child day-care facilities. *JAMA* 1993;269:883-8.
21. Blaser MJ, Newman LS. A review of human Salmonellosis: I. infective dose. *Rev Infect Dis* 1982;4(6):1096-106.