# Food Safety and the Antibiotic Resistance Crisis

According to a first-ever study by professors at the University of Regina in the United Kingdom, U.S. food safety ranks seventh or "average" among 17 other industrialized nations.[1] At least 76 million cases of food-borne disease occur each year in the U.S. While many health problems caused by contaminated food are not serious—with symptoms including diarrhea, vomiting, fever, chills, and muscle aches—some food-borne infections are much more dangerous, leading to convulsions, premature delivery and miscarriage, sepsis (blood poisoning), or even death. In all, food tainted with dangerous bacteria and other pathogens such as *E. coli* and *Salmonella* causes 300,000 hospitalizations and 5,000 deaths each year, according to the Centers for Disease Control and Prevention (CDC).[2] The death rate from some food-borne illnesses can be surprisingly high; one in five people who become sick from listeriosis (food poisoning caused by the bacteria *Listeria*) will die from it each year.[3]

Because of this high incidence of food-borne disease, many health experts are calling for enhanced safety throughout the entire food supply chain—from farm to fork. As the U.S. Government Accountability Office (GAO) explains in a 2008 report, the farm-to-fork approach can improve food safety by covering "every stage of the food production process, starting with how animals are raised and ending when food reaches the consumer."[4] The GAO report states that many other industrialized countries have adopted this approach to food safety in their food and feed laws governing farming, processing, and distribution, including the European Union, Canada, and Japan.

More than 225 hospitals and health care facilities have embraced such principals in the U.S. and have signed the "Healthy Food in Health Care Pledge" to express their commitment to supplying patients with nutritious food raised sustainably, including meat from animals raised without the use of antibiotics unless the farm animals are diagnosed with disease.[5] These facilities recognize that the current system of food production in the U.S. needs to be reformed as it is largely reliant upon methods of production and distribution that negatively impact public and environmental health. They argue that we should treat the food system "as preventive medicine that protects the health of patients, staff, and communities."

The food safety challenge in the United States is compounded by the growing crisis of antibiotic resistance. According to the Interagency Task Force on Antimicrobial Resistance (co-chaired by the CDC, Food and Drug Administration, and National Institutes of Health), unless antibiotic resistance "problems are detected as they emerge—and actions are taken quickly to contain them—the world may soon be faced with previously treatable diseases that have again become untreatable, as in the pre-antibiotic era."[6]

Many antibiotic-resistant strains of bacteria include those that cause common food-borne illness. These bacteria include, but are not limited to, *Escherichia coli* 0157:H7, *Salmonella*, *Listeria monocytogenes*, *Cyclospora cayetanesis*, and *Campylobacter jejuni*. For example, nearly 1.4 million people in the U.S. contract *Salmonella* infections annually, and of those, roughly one-fifth (272,000) of the infections are antibiotic-resistant. More than one-third of these (96,000) are multi-drug resistant, with resistance to at least five drugs.[7] There are about 2.4 million *Campylobacter* infections in the U.S. annually, and roughly half (more than 1.2 million) of those are resistant to at least one antibiotic, with nearly 14 percent of those (326,000) resistant to at least two drugs.[8]

One of the key factors contributing to a dramatic increase in antibiotic resistance is the routine feeding of antibiotics to animals that provide meat for our dinner tables—not because the animals are sick, but simply to make them grow larger faster and to compensate for crowded, unsanitary conditions on many industrial farms. This practice is called "nontherapeutic" use of antibiotics, and is rapidly becoming a food safety concern. Consumers are exposed to resistant bacteria through the consumption and handling of contaminated meat, through produce that has been exposed to resistant bacteria in soil and water, or even through direct contact with the bacteria in the environment. Food-borne bacteria such as *Salmonella* or *E. coli* are even more dangerous in their antibiotic-resistant form, because they are harder to treat and may require multiple antibiotic treatments, longer hospital stays and other interventions before finally being eliminated. This extra treatment adds billions of dollars in costs to the already over-burdened U.S. health care system.[9]

The routes in which people may come in contact with antibiotic-resistant bacteria include, but are not limited to:

- Improperly handling or consuming inadequately cooked contaminated meat.[10]
- Contact with infected farm workers or meat processors, or perhaps their families, doctors, and others with whom they interact.[11]
- Drinking surface or ground water and eating crops that have been contaminated by manure from factory farms that routinely feed antibiotics to healthy animals.[12]
- Contact with air that is vented from factory farms or is released during animal transport.[13]

The late Sen. Ted Kennedy and Rep. Louise Slaughter introduced legislation in March 2009—the Preservation of Antibiotics for Medical Treatment Act (PAMTA, H.R. 1549 / S. 619)—that would reduce the agricultural sector's contribution to the costly antibiotic resistance problem by requiring that drugs used in food animals undergo a safety review to ensure they do not contribute to resistance in people. Sens. Dianne Feinstein and Olympia Snowe are now leading the bill in the Senate. Existing and new drugs failing to show reasonable certainty of no harm to human health would be phased out of nontherapeutic use. The bill would still allow therapeutic antibiotic treatment of sick animals. The American Medical Association supports PAMTA, noting that "the legislation is an important step forward in reducing antimicrobial resistance by eliminating the inappropriate administration of antibiotics to healthy agricultural animals."[14]

**Medical and public health organizations supporting curtailing the nontherapeutic use of antibiotics in food animals include:**

- American Academy of Pediatrics[15]
- American College of Preventive Medicine[16]
- American Medical Association[17]
- American Public Health Association[18]
- Council of State and Territorial Epidemiologists, National Association of State Public Health Veterinarians[19]
- Infectious Diseases Society of America[20]
- World Health Organization[21]

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[1] Researchers compared countries across four major categories: consumer affairs, biosecurity, governance and recalls, and traceability and management. For traceability and management, the U.S. received a "poor" rating, ranking sixteenth. Charlebois, Sylvain and Chris Yost, May 2008, *Food Safety Performance World Ranking 2008,* Research Network in Food Systems, University of Regina: Saskatchewan, Canada. Abstract available at: http://www.ontraceagrifood.com/admincp/uploadedfiles/Food%20Safety%20Performance%20World%20Ranking%202008.pdf.

[2] CDC food safety website, http://www.cdc.gov/foodsafety/.

[3] U.S. Department of Agriculture, "Fact Sheet: Protect Your Baby and Yourself from Listeriosis," http://www.fsis.usda.gov/Fact_Sheets/Protect_Your_Baby/index.asp.

[4] U.S. Government Accountability Office, June 2008, *Food Safety: Selected Countries' Systems Can Offer Insights into Ensuring Import Safety and Responding to Foodborne Illness,* at http://www.gao.gov/new.items/d08794.pdf.

[5] See Health Care Without Harm, http://www.noharm.org/us/food/pledge.

[6] Interagency Task Force on Antimicrobial Resistance, *A Public Health Action Plan to Combat Antimicrobial Resistance*, http://www.cdc.gov/drugresistance/actionplan/html/executive-summary.htm.

[7] Calculations based on: USDA Economic Research Service, Foodborne Illness Cost Calculator: Salmonella,

http://www.ers.usda.gov/Data/FoodborneIllness/salm_Intro.asp; and U.S. Food and Drug Administration, *National Antimicrobial Resistance Monitoring System 2005 Executive report*, at http://www.fda.gov/cvm/2005NARMSExeRpt.htm (in 2005, 19.4% of human isolates were resistant, and 6.9% were resistant to at least 5 antimicrobials).

[8] Calculations based on: CDC Campylobacter fact sheet, at http://www.cdc.gov/nczved/dfbmd/disease_listing/campylobacter_gi.html#2; and CDC NARMS, *Human Isolates 2005 Final Report*, at http://www.cdc.gov/NARMS/annual/2005/NARMSAnnualReport2005.pdf.

[9] Harrison, P. and Lederberg, J. (eds). 1998. "Antimicrobial Resistance: Issues and Options." Workshop Report, Forum on Emerging Infections, Division of Health and Sciences Policy, Institute of Medicine. National Academy Press: Washington, D.C.

[10] U.S. General Accounting Office (GAO). 2004. No. 04-490, *Antibiotic Resistance: Federal Agencies Need to Better Focus Efforts to Address Risk to Humans from Antibiotic Use in Animals.* See also: White, David G. *et al*. 2001. The Isolation of Antibiotic-Resistant Salmonella from Retail Ground Meats. *The New England Journal of Medicine*. 345(16): 1147-1154; Molbak, K. *et al*. 1999. An Outbreak of Multidrug-Resistant, Quinolone-Resistant *Salmonella Enterica* Serotype Typhimurium DT104. *The New England Journal of Medicine*, 341(19): 1420-1425; and Johnson, James R. *et al*. 2006. Similarity between Human and Chicken *Escherichia coli* Isolates in Relation to Ciprofloxacin Resistance Status. *Journal of Infectious Diseases* 194(1): 71-78.

[11] GAO, *op. cit.* See also: Price, Lance B. *et al*. 2007. Elevated Risk of Carrying Gentamicin-Resistant *Escherichia coli* among U.S. Poultry Workers. *Environmental Health Perspectives* 115(12): 1738-1742; and Smith, Tara C. *et al*. 2009. Methicillin-Resistant *Staphylococcus aureus* (MRSA) Strain ST398 Is Present in Midwestern U.S. Swine and Swine Workers. *PLoS ONE* 4(1): 1-6.

[12] GAO, *op. cit.* See also: Chee-Sanford, J. C. *et al*. 2001. Occurrence and Diversity of Tetracycline Resistance Genes in Lagoons and Groundwater Underlying Two Swine Production Facilities. *Applied and Environmental Microbiology* 67(4): 1494-1502; Sapkota, A. R. *et al*. 2005. Antibiotic-Resistant Enterococci and Fecal Indicators in Surface Water and Groundwater Impacted by a Concentrated Swine Feeding Operation. *Environmental Health Perspectives* 115(7): 1041-1045; and Gibbs, Shawn G. *et al*. 2005. Isolation of Antibiotic-Resistant Bacteria from the Air Plume Downwind of a Swine Confined or Concentrated Animal Feeding Operation. *Environmental Health Perspectives* 114(7): 1032-1037.

[13] Rule, Ana M., S. L. Evans, and E. K. Silbergeld. 2008. Food animal transport: A potential source of community exposures to health hazards from industrial farming (CAFOs). *Journal of Infection and Public Health.* 1: 33-39.

[14] AMA PAMTA endorsement letter to Rep. Louise Slaughter, April 9, 2009.

[15] "Endorsements of the Preservation of Antibiotics for Medical Treatment Act," revised June 14, 2006, at http://www.keepantibioticsworking.org/new/resources_library.cfm?RefID=73271. See also "Keep Antibiotics Working Urges FDA Acting Commissioner to Take Strong, Quick Action to Combat Antimicrobial Resistance Crisis," April 3, 2009, at: http://www.keepantibioticsworking.org/new/news.cfm?RefID=105689.

[16] ACPM, January 23, 2002, "Principles for Combating Antibiotic Resistance," Policy Resolution # 05-02(A).

[17] AMA, 2001, "Antimicrobial Use and Resistance," Resolution 508, http://www.keepantibioticsworking.com/library/uploadedfiles/American_Medical_Association_Resolution_508_-_.htm.

[18] APHA, January 1, 1999, "Addressing the Problem of Bacterial Resistance to Antimicrobial Agents and the Need for Surveillance," Policy No. 9908, http://www.apha.org/advocacy/policy/policysearch/default.htm?id=179.

[19] CSTE/NASPHV, 1999, "Discontinuation of antimicrobials used to promote growth of food animals if they are used in or select for cross resistance to antimicrobials used in human therapy," Position Statement 1999-ID 7, http://www.cste.org/dnn/AnnualConference/PositionStatements/tabid/191/Default.aspx.

[20] IDSA PAMTA endorsement letter to Sen. Kennedy, June 12, 2007.

[21] WHO, 2000, *WHO Global Principles for the Containment of Antimicrobial Resistance in Animals Intended for Food*, Geneva.