Antibiotic-Resistant Bacteria in Animals and Unnecessary Human Health Risks

Antibiotics on the Farm

In the United States, many food animals—poultry, swine and cattle—are routinely treated with antibiotics in order to grow animals faster and to compensate for unsanitary conditions on many industrial farms. Recently, major increases in antibiotic-resistant bacterial infections in human populations have led to public health concerns regarding antibiotic use for non-therapeutic purposes (*i.e.*, not used to treat disease) in animals destined for food production.[i]

Bacteria are able to develop antibiotic resistance when exposed to low doses of drugs over long periods of time. To promote growth and weight gain, entire herds or flocks of farm animals are routinely fed antibiotics at low levels in their feed or water—a practice that has been identified as a contributor to antibiotic resistance.[ii] In addition, antibiotics are used to stave off disease in entire herds or flocks living in often crowded, unsanitary conditions.

Industrialized hog production (source: USDA)

Because there are currently minimal regulations requiring drug manufacturers or food animal producers to report how antibiotics are marketed and used in food animal production, the scale of antibiotic use in food animals is unknown. Estimates vary greatly on the amount of antibiotics fed to farm animals, but between 30 to 70 percent of all antibiotics and related drugs sold in the U.S.[iii] Poor data on animal drug production, distribution and resistance all unnecessarily contribute to the risks associated with developing resistant diseases in animals and humans.

Evidence of Human Health Impacts

During the late 1990s, the same resistant strains of *Campylobacter* bacteria, one of the most common causes of diarrheal illnesses in humans, were discovered in chickens and people.[iv] Both kinds of bacteria were resistant to fluoroquinolones, a class of antibiotics of important use in human medicine.

Prior to 2005, farmers also used fluoroquinolones on chicken flocks for prevention and treatment of respiratory disease. Often, whole flocks received the antibiotics indiscriminately through drinking water, which quickly led to the development of resistant bacteria.[v] Through molecular subtyping, researchers were able to trace the resistant bacteria found in humans back to poultry.[vi]

Industrialized broiler housing (source: USDA)

Battery cages for layer hens (source: Wikimedia Commons)

Earlier studies in the 1980s linked multi-drug resistant *Salmonella* infections in humans to exposure to cattle on dairy farms.[vii] Further studies and molecular subtyping found rapidly growing, widespread emergence of resistance in *Salmonella* infections in humans in the United States, which researchers concluded were likely from food animals.[viii]

Unnecessary Risk; Little Gain

Although the use of fluoroquinolones in poultry was banned in the U.S. in 2005, the vast array of antibiotics that are still used in food animals continue to pose a threat to human health. A joint report by the U.N. Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE) and the World Health Organization (WHO) found that the use of antibiotics in humans and animals places individuals at increased risk for infection, higher numbers of treatment failures and increased severity of illness.[ix]

These impacts on human health can result in both higher frequency and longer duration of hospitalizations, raising the cost of health care. Researchers with the Alliance for the Prudent Use of Antibiotics and Cook County Hospital in Chicago estimate the extra costs to the U.S. health care system due to antibiotic-resistant infections range from $16.6 billion to $26 billion per year.[x]

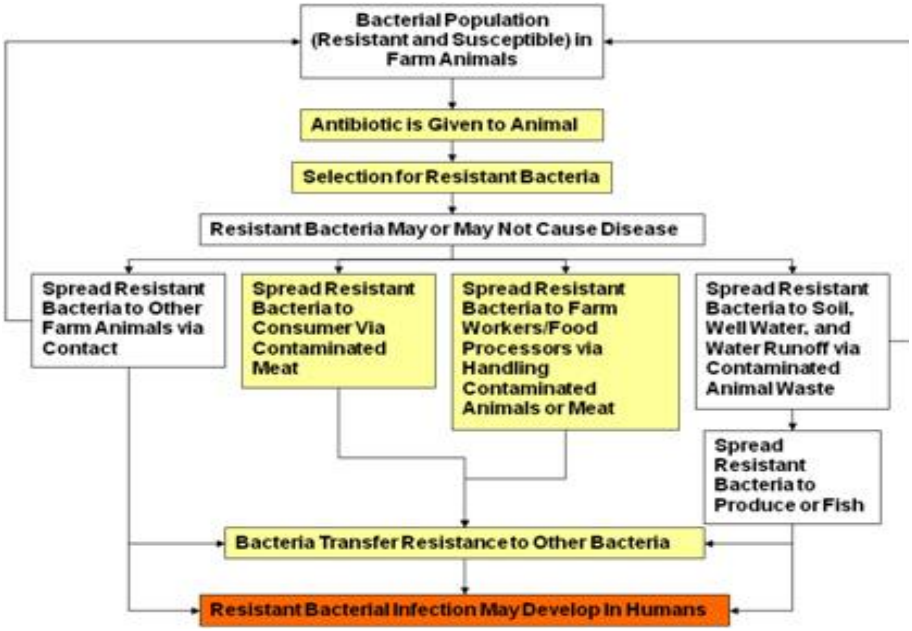
The overuse of antibiotics in food animals is leading to increased risk of human illness and increased health care costs, with little to no agricultural economic benefit. Recent economic analysis of antibiotic use in poultry disputes the myth that using drugs nontherapeutically results in large economic gains. In fact, data show that improving management of farm animals *(e.g.*, cleaning facilities more thoroughly and frequently) achieves the same benefits as nontherapeutic antibiotic use.[xi]

Improving Oversight of Drug Use and Decreasing the Threat to Human Health

Because of poor regulations and oversight of drug use in industrial farm animals, consumers in the U.S. do not know what their food is treated with, or how often. There is no standard limiting the amount of antibiotic-resistant bacteria in meat. In order to curtail the development of antibiotic resistance in farm animals, and the unnecessary threat it poses to the public, the use of antibiotic drugs in poultry and livestock must be more carefully regulated and monitored. Congress should begin tackling the problem by reforming reporting and monitoring requirements for drug manufacturers and food producers, and by curtailing the nontherapeutic use of antibiotics in animals.

Pathways for Transferring Antibiotic-Resistant Bacteria from Farm Animals to Humans

There are four major pathways in which resistant bacteria can spread from animals to humans. Most commonly, consumers or workers handling contaminated meat can acquire the bacteria on their skin or in a cut. Bacteria can also spread to other animals and into the environment via farm waste runoff.



Adapted from GAO, 2004, Op cit.

Legislation to Address the Problem

In August 2008, President George W. Bush signed legislation passed by Congress to reauthorize and amend the Animal Drug User Fee Act (ADUFA), a law that grants FDA authority to collect fees for animal drug applications. At the same time, the amendments require drug makers to report annually the amount, strength, dosage, and intended purpose of antimicrobials used in food animals. This is an important first step in improving data collection on the use of antibiotics in industrial farming, which can help public health officials track and respond to incidences of antibiotic resistance. More should now be done to curb nontherapeutic use of the drugs in agriculture, in order to preserve their efficacy in people.

In the 111th Congress, legislation, led by Representative Louise Slaughter (D-NY) in the U.S. House of Representatives and Senators Olympia Snowe (R-ME) and Dianne Feinstein (D-CA) in the U.S. Senate, would limit antibiotic use in livestock and poultry to treating sick animals. The Preservation of Antibiotics for Medical Treatment Act (PAMTA, H.R. 1549/S.619), phases out the routine use of seven classes of medically important antibiotics in healthy food animals unless manufacturers can prove reasonable certainty of no danger to public health from resistance. New drugs are required to

meet the same standard. PAMTA critically shifts the burden of proof to the drug manufacturers to ensure antibiotics used in farm animal production have no human health impacts. Congress should consider this proposal when addressing food safety and health care legislation.

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[i] U.S. General Accounting Office (GAO). 2004. Report to Congressional Requesters No. 04-490, "Antibiotic Resistance: Federal Agencies Need to Better Focus Efforts to Address Risk to Humans from Antibiotic Use in Animals." <www.gao.gov/new.items/d04490.pdf>.

[ii] For more information on antibiotic resistance, please see Pew's factsheet titled: "Antibiotic Resistance and the Industrial Animal Farm."

[iii] The Animal Health Institute, a trade association representing drug manufacturers, uses the 30% figure. The Union of Concerned Scientists estimates use as closer to 70 percent. The Institute of Medicine estimated in 1985 that subtherapeutic use in cattle, swine and poultry totaled 16.1 million pounds, or more than half of all antimicrobials produced at that time.

[iv] GAO, 2004, *Op cit.*

[v] Keep Antibiotics Working, "In Depth: Fluoroquinolones: Unnecessary Risks," accessed 7/1/08. <www.keepantibioticsworking.com/new/indepth_fluoro.cfm >.

[vi] Smith, K.E, *et al.* 1999. Quinolone-resistant *Campylobacter jejuni* infections in Minnesota, 1992-1998. *New England Journal of Medicine*. 340(20): 1525-1532.

[vii] O'Brien, T., *et al.* 1982. Molecular epidemiology of antibiotic resistance in *Salmonella* from animals and human beings in the United States. *New England Journal of Medicine*. 307(1):1-6.

[viii] GAO, 2004, *Op cit.*

[ix] UN FAO, OIE, and WHO, "Joint FAO/OIE/WHO Expert Workshop on Non-Human Antimicrobial Usage and Antimicrobial Resistance: Scientific Assessment," Presented in Geneva, Switzerland, Dec. 1-5, 2003. <www.who.int/foodsafety/micro/meetings/nov2003/en/>.

[x] Roberts, R.R., *et al.* 2009. Hospital and Societal Costs of Antimicrobial-Resistant Infections in a Chicago Teaching Hospital: Implications for Antibiotic Stewardship. *Clinical Infectious Diseases* 49:1175–84.

[xi] Graham JP, Boland JJ, Silbergeld E. "Growth promoting antibiotics in food animal production: an economic analysis." *Public Health Rep* 2007; 122:79-87; and Miller GY, Algozin KA, McNamara PE, Bush EJ. "Productivity and economic effects of antibiotics use for growth promotion in U.S. pork production." *Journal of Agricultural and Applied Economics* 2003; 35:469-482.