Based on decades of scientific data, U.S. and international governmental organizations have concluded that the overuse of antibiotics in food animal production contributes to human antibiotic resistance. Nearly 30 million pounds of antibiotics were sold in the United States for use in livestock and poultry in 2011—almost four times the amount sold for treating sick people.1

According to the U.S. Food and Drug Administration: “It is well established scientifically that all uses of antimicrobial drugs, in both humans and animals, contribute to the development of antimicrobial resistance, and that this is an important public health concern. Experts agree that antimicrobial drugs must be used ‘judiciously’ in both animal and human medicine to slow the development of resistance.”2

The research on antibiotic use in food animals contributing to the growing health crisis of antibiotic resistance in humans dates back more than 40 years. Below are highlights from this significant body of literature, including testimony of federal officials, reviews of peer-reviewed journal articles, and individual examples from within the studies.

Recent testimony of federal agency officials

During House hearings in July 2010, FDA, the U.S. Centers for Disease Control and Prevention and the U.S. Department of Agriculture affirmed the definitive scientific evidence that the overuse of antibiotics in food animal production contributes to the development of antibiotic-resistant bacterial infections in people.

- A USDA deputy administrator testified, “USDA believes that it is likely that the use of antibiotics in animal agriculture does lead to some cases of antibacterial resistance among humans.”3
- An FDA principal deputy commissioner testified, “The overall weight of the available evidence to date supports the conclusion that using medically important antimicrobial drugs for production purposes is not in the interest of protecting and promoting the public health.”4
- CDC gave similar testimony, and the head of the agency wrote a follow-up letter to earlier statements affirming, “studies related to salmonella, including many studies in the United States, have demonstrated that (1) use of antimicrobial agents in food animals results in antimicrobial resistance in food animals, (2) resistant
strains are present in the food supply and commonly transmitted to humans, and (3) increases in resistant strains result in adverse human health consequences (e.g., increased hospitalization).5 5

**Major government reviews**

- The CDC stated in 2014 that “because of the link between antibiotic use in food-producing animals and the occurrence of antibiotic-resistant infections in humans, antibiotics should be used in food-producing animals only under veterinary oversight and only to manage and treat infectious diseases, not to promote growth.”6
- The Government Accountability Office concluded in 2011 that antibiotic-resistant bacteria can spread from animals and cause disease in humans through a number of pathways.7 The GAO had concluded from a 2004 review of existing data that antibiotic-resistant bacteria have been transmitted from animals to humans and pose a significant threat to human health: “[Scientific studies] demonstrate a relationship between the use of antimicrobials in food-producing animals, antibiotic resistance in humans, and adverse human health consequences as a result. We believe that there is a preponderance of evidence that the use of antimicrobials in food-producing animals has adverse human consequences. ... There is little evidence to the contrary.”8
- A 2003 joint report by the Food and Agriculture Organization of the United Nations, the World Organization for Animal Health, and the World Health Organizationconcluded: (1) “There is clear evidence of adverse human health consequences due to resistant organisms resulting from non-human usage of antimicrobials”; (2) “the foodborne route is the major transmission pathway for resistant bacteria and resistance genes from food animals to humans, but other routes of transmission exist”; and (3) the “consequences of antimicrobial resistance are particularly severe when pathogens are resistant to antimicrobials critically important in humans.”9
- A 2003 report by the Institute of Medicine the health arm of the National Academy of Sciences, recommended that “FDA ban the use of antimicrobials for growth promotion in animals if those classes of antimicrobials are also used in humans.”10
- A 1997 report by WHO stated that based on the weight of existing scientific evidence, “low-level, long-term exposure to antimicrobials may have greater selective potential than short-term, full-dose therapeutic use” and recommended ending the use of important human antibiotics for growth promotion in food animals.11
- A 1988 study by the Institute of Medicine found a considerable body of indirect evidence implicating both subtherapeutic and therapeutic use of antimicrobials in food animals as a potential human health hazard.12
- A 1970 task force review by FDA acknowledged evidence showing that antibiotic use in food-producing animals, especially in subtherapeutic amounts, was associated with the development of drug-resistant bacteria, and that treated animals might serve as a reservoir of antibiotic-resistant pathogens that could produce human disease.13

**Highlights from individual studies and journal reports**

- A January 2014 study found that rural patients living within one mile of an industrial farm raising more than 2,500 hogs who were admitted to Veterans Affairs hospitals in Iowa were three times more likely to be carrying methicillin-resistant Staphylococcus aureus, or MRSA, than other rural veterans.14
- Two studies in 2013 found that people working on or living near pig farms or agricultural fields fertilized with pig manure were more likely to become infected with MRSA. In the first study, those who had the highest exposure to manure were 38 percent more likely to acquire MRSA in the community, and 30 percent were more liable to become infected with it in a hospital. The second study found that 8 percent of pigs raised on
confinement operations and 87 percent of the workers there carried MRSA, whereas no such bacteria were detected among pigs or people on antibiotic-free operations.\textsuperscript{15}

- A 2012 study used genetic fingerprinting technology to trace the origin of one strain of MRSA that was spreading among livestock and humans in Europe and the United States. It concluded that humans passed a drug-susceptible strain of \textit{Staphylococcus aureus} to animals. Once in livestock exposed to antibiotics, the bacteria developed resistance and now have been shown to spread from livestock to people.\textsuperscript{16}

- A 2010 study from the Public Health Agency of Canada showed that voluntary withdrawal of extralabel (for reasons not indicated on the label) cephalosporin use in poultry resulted in a dramatic decrease in related drug resistance in chicken \textit{Salmonella} Heidelberg and \textit{E. coli}, and a similar drop in drug-resistant \textit{Salmonella} Heidelberg infections in people. A partial reintroduction of the drug in hatcheries caused a rise in drug-resistant \textit{E. coli}.\textsuperscript{17}

- A 2007 study by the CDC and the U.S. Department of Veterans Affairs in Minnesota found that antibiotic-resistant \textit{E. coli} in people was likely to have come from poultry.\textsuperscript{18}

- Studies in 2001, 2008, and 2012 suggest that drug-resistant \textit{E. coli} strains in the human urinary tract may come from livestock.\textsuperscript{19}

- A 2003 federal study found that a specific strain of salmonella infection in New England rose from 0 to 53 percent between 1998 and 2001, showed resistance to several antimicrobials used in livestock, and mirrored the same infections in cattle.\textsuperscript{20}

- A 1999 Minnesota study reported that ciprofloxacin-resistant \textit{Campylobacter} was found in 14 percent of domestic chicken products, and that the number of related human infections had increased, largely because of poultry consumption.\textsuperscript{21}

- A 1984 study by the U.S. Public Health Service, FDA, and Seattle-King County found that tetracycline-resistant \textit{Campylobacter} appeared “to flow from chickens to man via consumption of poultry products.”\textsuperscript{22}

\textit{Endnotes}


12 Institute of Medicine, Human Health Risks With the Subtherapeutic Use of Penicillin or Tetracyclines in Animal Feed (1988).
22 U.S. Public Health Service, U.S. FDA, U.S. Bureau of Veterinary Medicine, Seattle-King County Department of Public Health, Communicable Disease Control Section, Surveillance of the Flow of Salmonella and Campylobacter in a Community (1984),

For further information, please visit: saveantibiotics.org

Contact: Shannon Heyck-Williams, government relations officer, The Pew Charitable Trusts.
Email: sheyck-williams@pewtrusts.org
Phone: 202-887-8801
Project website: saveantibiotics.org

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