

Low-Level Use of Antibiotics In Livestock and Poultry

Executive Summary

Antibiotics have long been used to treat illnesses in humans and farm animals. About 50 years ago, the U.S. Food and Drug Administration (FDA) approved their use in feed in subtherapeutic or low doses to help animals grow faster, produce more meat and avoid illness.

As antibiotic use increased in both animals and humans, bacteria emerged that are resistant to the same drugs given to both. There is also evidence that resistance may develop in chemically similar bacteria.

Scientists agree that the widespread use — and overuse — of antibiotics to treat disease in humans is the primary cause for the increase in resistant bacteria. A growing body of science suggests a link between the low-level use of antibiotics in farm animals and the increase in bacteria resistant to the same or similar antibiotics administered to humans. The leading health agencies in the U.S. and European Union (EU) and World Health Organization (WHO) agree that the link is serious enough to ban the subtherapeutic use of at least some antibiotics in farm animals. In 2001, the American Medical Association (AMA) approved a resolution to ban all low-level use. The FDA, EU and WHO are selectively banning such use, blocking the drugs that are used in both animals and humans. Consumer advocacy groups strongly support these actions and are calling for more widespread bans. Animal health groups disagree, saying that a small percentage of antibiotics are put to nonmedical uses, minimizing this application in promoting drug resistance.

The U.S. Department of Agriculture (USDA) and animal health organizations have developed guidelines to limit low-level use. Major private buyers of livestock products such as the McDonald's Corporation are requiring suppliers to stop using antibiotics as growth-promoters that are also given to humans. To be certified organic, U.S. meat must come from animals raised without antibiotics.

At issue is whether low-level use of antibiotics in animal feed should be more widely banned.

1. Why are antibiotics routinely fed to livestock and poultry?

There are three major reasons, according to the CDC:¹

- Treat sick animals.

As antibiotic use has increased in both animals and humans, bacteria have emerged that are resistant to the same drugs given to both.

At issue is whether low-level use of antibiotics in animal feed should be more widely banned.

¹ CDC National Anti-microbial Resistance Monitoring Systems (NARMS) "FAQ: Antibiotic Resistance and Foodborne Illness" (www.cdc.gov/narms/faq.htm).

The Food Marketing Institute (FMI) is a nonprofit association conducting programs in research, education, industry relations and public affairs on behalf of its 2,300 members including their subsidiaries — food retailers and wholesalers — in the United States and around the world. FMI's U.S. members operate approximately 26,000 retail food stores with a combined annual sales volume of \$340 billion — three-quarters of all food retail store sales in the United States. FMI's retail membership is composed of large multi-store chains, small regional firms and independent supermarkets. Its international membership includes 200 members from 60 countries.



- Prevent disease among animals susceptible to infections. This use affects a larger number of animals, because it usually involves treating a whole herd or flock, which increases the likelihood of genetic selecting for organisms that are resistant to the antibiotic.
- Promote the growth of cattle, poultry and swine when they are fed low doses for long periods. As a growth-promoter, antibiotics in feed help animals gain weight more efficiently by controlling the bacteria that can interfere with their ability to absorb nutrients. Animals become healthier, grow faster and stronger, and fewer die from disease.

As a growth promoter, antibiotics in feed help animals gain weight more efficiently by controlling the bacteria that can interfere with their ability to absorb nutrients.

2. Are drug residues in food the issue?

No. USDA routinely inspects meat, poultry and egg products for residues that exceed tolerance levels. The inspectors seldom find residues that exceed safe levels. The issue here involves antibiotic *resistance* of bacteria, not antibiotic residues.

It is also important to understand that resistance has nothing to do with potency. The resistant bacteria are not stronger; they simply cannot be treated with antibiotics that are currently available.

The issue here involves antibiotic resistance of bacteria, not antibiotic residues.

3. Why has antibiotic resistance increased in humans?

It is widely accepted that the primary cause is overuse and misuse of antibiotics. In some cases, doctors prescribe or patients demand the drugs too frequently or inappropriately, such as for illnesses that are not caused by bacteria and do not respond to antibiotics. In other cases, patients fail to complete the prescribed course of an antibiotic treatment, making it more likely that surviving bacteria will develop resistance to the drug.

There is also evidence that antibiotic use in food-producing animals contributes to human drug resistance, although to a far lesser degree than human use does. The controversy centers over how significant this contribution is, how much of the problem stems from subtherapeutic use and how to respond.

4. What triggered the controversy?

The issue emerged in 1984 when a CDC study linked antibiotics in livestock and poultry feed to resistant bacteria in humans.² The issue resurfaced in the 1990s with reports about the emergence of antibiotic-resistant strains of *Salmonella*, *Campylobacter* and *E. coli* O157:H7. CDC reported an increase in resistance in laboratory samples from 0.6 percent in 1979 to 34 percent in 1996.³ The study noted that a serotype of *Salmonella* known as DT104 is resistant to five antibiotics and has become a major cause of illness in humans and animals in Europe, especially in the United Kingdom.

A Minnesota study linked an increase in quinolone-resistant *Campylobacter jejuni* infections from 1992 through 1998 to the licensing

The issue emerged in 1984 when a CDC study linked antibiotics in livestock and poultry feed to resistant bacteria in humans.

² “Drug-Resistant Salmonella From Animals Fed Antimicrobials,” *New England Journal of Medicine*, September 6, 1984.

³ “Emergence of Multidrug-Resistant *Salmonella enterica* Serotype Typhimurium DT104 Infections in the United States,” *New England Journal of Medicine*, May 7, 1998.

of fluoroquinolones for use in livestock and poultry.⁴ FDA approved these drugs in 1995 to prevent bacterial diseases in poultry. The report cited Minnesota Health Department data showing that *Campylobacter* became increasingly resistant to a fluoroquinolone. The resistant bacteria were found in samples from people suffering from foodborne illness.

A 2001 study cited the appearance of bacteria resistant to the drug Synercid (quinupristin/dalfopristin) in patients who had never been exposed to it, suggesting a nonhuman source.⁵ Synercid is an antimicrobial used as a last-resort treatment against antibiotic-resistant bacteria. FDA was assessing the possible link between human resistance to quinupristin/dalfopristin and the use of a structurally related growth-promoter in animals.

5. What is the position of the scientific community?

There is considerable debate over the use of antibiotics to promote growth in farm animals. Among the strongest opponents is the World Health Organization (WHO), which in August 2003 recommended that nations stop using antibiotics for growth promotion. WHO asserts that “the largest quantities” of antimicrobials given at low doses to food-producing animals “are used as regular supplements for . . . growth promotion, thus exposing a large number of animals, irrespective of their health status”⁶ Its recommendation was based on a Denmark study of food-producing animals that have not consumed antibiotic growth promoters since the end of 1999. The Danish ban led to significant declines in resistant bacteria in pork and chicken: 60-80 percent had bacteria resistant to three widely used antibiotics before the ban, compared with 5-35 percent afterwards.

In June 2001, the American Medical Association adopted a resolution opposing all subtherapeutic use of antibiotics in farm animals.⁷

Others say such action is unnecessary. In September 2003, scientists at the Interscience Conference on Antimicrobial Agents and Chemotherapy released a study of two macrolide antibiotics, tylosin and tilmicosin. They found that the risk of humans acquiring resistant bacteria by eating meat or poultry from animals treated with the drugs is less than one in 10 million per year for resistant *Campylobacter* and less than one in three billion for *E. faecium*. “People would be more likely to die from a bee sting than for their antibiotic treatment to fail because of macrolide-resistant bacteria in meat or poultry,” said Stephanie Doores, Ph.D., of Pennsylvania State University.⁸

There is considerable debate over the use of antibiotics to promote growth in farm animals.

In June 2001, the American Medical Association adopted a resolution opposing all subtherapeutic use of antibiotics in animals.

⁴ “The Consequences for Food Safety of the Use of Fluoroquinolones in Food Animals,” *New England Journal of Medicine*, May 20, 1999.

⁵ Nawaz, Mohammed S., et al. “Human Health Impact and Regulatory Issues Involving Antimicrobial Resistance in the Food Animal Production Environment.” *Regulatory Research Perspectives*, July 2001.

⁶ Communicable Diseases Cluster, *WHO Global Strategy for Containment of Antimicrobial Resistance*.

⁷ Res. 508, A-01, H-440.895, Antimicrobial Use and Resistance.

⁸ AVMA press release, “New Antibiotic Risk Assessment Concludes Macrolides Can Be Safely Used in Food Animal Production,” September 16, 2003.

FDA, CDC and USDA all agree that antibiotics are as critical in treating bacterial infections in animals as in humans. Government scientists also acknowledge the relationship between the use of antibiotics in food-producing animals and the emergence of drug-resistant bacteria that can infect people.

FDA, CDC and USDA all agree that antibiotics are critical in treating bacterial infections in animals as well as humans.

6. Where do animal health experts stand on this issue?

Antibiotic resistance is a major concern among drug manufacturers and veterinarians. The Animal Veterinary Medical Association (AVMA) notes that “evidence is accumulating to support the hypothesis that antimicrobial resistance in animals can result in the transfer of resistant bacteria . . . or genetic determinants to humans through the food supply by direct animal-to-human contact or indirectly through the environment.”⁹ In May 2003, AVMA issued a position statement reading, in part, “The AVMA supports a national, coordinated, and appropriate response to the issue of antimicrobial resistance in bacteria that includes an open or public FDA approval process that is rigorous and that includes an assessment of food safety to approve animal health products for use in animals.” AVMA, the Animal Health Institute (AHI) and other groups are now developing guidelines for the prudent use of antibiotics in farm animals.

At the same time, some animal health experts argue that most of the antibiotics given to farm animals are to prevent or treat illnesses, and that relatively little is administered to promote growth. AHI says each ton of animal feed contains just four to 25 grams of antibiotics, with only 13 percent of all antibiotics in animal feed used for growth promotion. AHI also cites declines in the incidence of drug-resistant *Salmonella* and *Campylobacter* in humans since 1996, pointing to data from CDC’s National Antimicrobial Resistance Monitoring Systems (NARMS).¹⁰

*‘Each ton of animal feed contains just four to 25 grams of antibiotics, with only 13 percent of all antibiotics in animal feed used for growth promotion.’
— Animal Health Institute*

In 2001, a study by the European Federation of Animal Health concluded that humans consumed 65 percent of all antibiotics administered in the European Union in 1999, versus 35 percent for animals. The study found that only 6 percent of all antibiotics took the form of growth promoters in animal feed. It also claimed that this use of antibiotics fell by 50 percent between 1997 and 1999. Reacting to these findings, the Animal and Plant Health Association (APHA) asserted that the use of antibiotics in farm animals is, at most, only a “very small contributing factor to the problem of antimicrobial resistance,” according to Declan O’Brien, the group’s director.¹¹

7. What is the position of consumer advocates?

The Union of Concerned Scientists (UCS) supports reducing the use of antibiotics in food animals, saying the drugs produce benefits that “are

⁹ AVMA, “Judicious Therapeutic Use of Antimicrobials” (www.avma.org/scienact/jtua/default.asp).

¹⁰ See footnote 8.

¹¹ APHA press release, “Antibiotic Use in Farm Animals Does Not Threaten Human Health, a New Study Suggests,” June 13, 2001.

economic, not therapeutic.” In a January 2001 report titled “Hogging It!: Estimates of Antimicrobial Abuse in Livestock,” the advocacy group estimated that U.S. livestock producers use 24.6 million pounds of antimicrobials for subtherapeutic purposes each year, including tetracycline, penicillin, erythromycin and other drugs that are important for human use. The group argues that banning or curtailing this use “would have the added benefit of pushing livestock management in the direction of more sustainable practices.”

In 1998, UCS joined the Center for Science in the Public Interest (CSPI) and other advocacy groups in petitioning FDA to withdraw approval of farm uses of antibiotics that threaten human health. “Specifically, the FDA should not allow an antibiotic to be used as a livestock feed additive if that antibiotic is used (or related to one used in) human medicine,” according to CSPI.¹²

CSPI reasserted this appeal in 1999 after a study in the *New England Journal of Medicine* showed that humans with fluoroquinolone-resistant *Campylobacter* most likely acquired the infection by eating poultry that had been given these antibiotics.

The following year, FDA’s Center for Veterinary Medicine banned subtherapeutic use of fluoroquinolones in poultry. In March 2004, and FDA administrative law judge upheld the ban.

8. How has the federal government responded?

HHS is coordinating a public health plan to address antimicrobial resistance. A key player is USDA, which approves all antibiotics used for food-producing animals. In recent years, the agency has acknowledged a proven — though unquantifiable — link between the use of antibiotics in animals and drug resistance in humans.

Since 1996, USDA has engaged in programs to better understand, track and reduce antimicrobial resistance in humans. These efforts include supporting improved nutrition for farm animals, biosecurity to minimize infections on farms and prudent use of antibiotics. USDA now undertakes three activities related to antimicrobial resistance: surveillance, research, and prevention and control.

In 1996, the agency’s Food Safety and Inspection Service (FSIS) joined with CDC, FDA and 28 state and local health departments to establish the NARMS Enteric Bacteria program to test for antimicrobial resistance in agriculture. The program collects and analyzes *Salmonella*, *Campylobacter*, *E. coli* and *Enterococcus* samples from animals and humans. Among other monitoring projects, the NARMS initiative also investigates outbreaks caused by particular bacteria,

The FDA Center for Veterinary Medicine (CVM) investigates antibiotic resistance. It must approve every drug used in animals, looking at how drugs may harm animals and humans who consume the meat. It works with USDA to inspect food products, such as sampling body

The FDA Center for Veterinary Medicine must approve every drug used in animals, looking at how drugs may harm animals and humans who consume the meat.

Since 1996, USDA has engaged in programs to better understand, track and reduce antimicrobial resistance in humans.

¹² CSPI Petition to the U.S. Food and Drug Administration to Ban the Use of Certain Antibiotics in Livestock Feed (www.cspinet.org/reports/petition_antibiotic.htm).

tissues from slaughtered animals. CVM has also taken steps to enable the animal-drug approval system to make adjustments when antimicrobial resistance becomes a concern, either for human or animal treatment. The adjustments are incorporated into a framework that calls for drugs with the highest risk of creating problems for human therapy to be the least likely to be approved for animal uses.

Other government responses:

- USDA National Organic Program, which took effect in 2002, permits neither subtherapeutic nor therapeutic antibiotics in organic livestock.
- Bipartisan legislation introduced in July 2003 would phase out the use of subtherapeutic drugs in livestock that are used to treat or prevent infection in humans. The drugs would still be used to treat sick animals; they also would retain approval for subtherapeutic use if their manufacturers prove that such use poses no risk to human health.¹³

USDA National Organic Program permits neither subtherapeutic nor therapeutic antibiotics in organic livestock.

9. How has the industry responded?

Many companies that make medicines for animals, together with veterinarians, food producers and others, have expressed interest in working with U.S. and global authorities to enhance monitoring and surveillance programs. Some companies have also altered their practices.

Groups such as AHI and AVMA are developing guidelines for the prudent use of antibiotics in farm animals. These include guidelines for “judicious therapeutic use of antimicrobials” in pork and poultry production, as well as for the veterinarians of beef cattle, dairy cows, swine and poultry.

Groups such as AHI and AVMA are developing guidelines for the prudent use of antibiotics in farm animals.

In 2001, AVMA and the American Association of Veterinary Laboratory Diagnosticians initiated a pilot project to develop a monitoring program for animal pathogen resistance.

In June 2003, the McDonald’s Corporation announced a policy giving direct suppliers until the end of 2004 to stop using 24 growth-promoting antibiotics that are also used in human medicine. The fast-food giant’s producers supply more than 2.5 billion pounds of chicken, beef and pork annually, prompting speculation that the policy could set the stage for others to take similar steps. The Coalition for Animal Health — consisting of AHI, AVMA and other industry groups — condemned the policy as not being grounded in science, noting that the banned products have received FDA approval.¹⁴

¹³ American Veterinary Medical Association, “Lawmakers seek to curb antimicrobial use in livestock,” *JAVMA News*, September 15, 2003 (www.avma.org/onlnews/javma/sep03/030915q.asp).

¹⁴ *AgriNews Online*, “Industry coalition questions WHO recommendation on antibiotics,” September 9, 2003 (www.agrinewspubs.com).

10. What are the economic implications of restricting or banning subtherapeutic use of antibiotics?

This, too, is subject to debate. According to a 2003 Iowa State University study, a U.S. ban on growth-promoting antibiotics in hog feed would increase disease-treatment costs by \$4.50 per pig per year (\$700 million over 10 years).¹⁵ Funded in part by the National Pork Board, this study was based on Denmark’s suspension of antibiotics used for subtherapeutic purposes. It found that most of the costs were incurred when the ban was imposed at the weaning stage, when piglets “encountered severe health problems and incurred large costs” by requiring more antibiotics as therapeutic medications.

In its own review of Denmark’s experience, the World Health Organization (WHO) said the ban increased the cost of producing pigs by just over 1 percent. The WHO report noted that this figure excluded some costs, including some “associated with modifications of the production systems,” but added that additional production costs “may be at least partially offset by the benefits of increased consumer confidence in, and demand for, Danish pig and poultry meat produced without antimicrobial growth promoters.”¹⁶

11. How significant an issue is the use of antibiotics in animal feed outside the United States?

The United Kingdom (UK) banned the use of penicillin and tetracycline for growth promotion in the early 1970s; Sweden banned the use of all antibiotics for growth promotion in 1986; and Denmark banned the use of the antibiotic virginiamycin in animal feed in 1998. Virtually no antimicrobial growth-promoters have been used in Denmark since the end of 1999.

Recent actions taken by the European Union (EU) may stem from the outbreak of mad cow disease in Britain in the 1990s. In July 1999, the EU banned four widely used antibiotics in animal feed that are similar to drugs used in human medicine after banning 15 antibiotics for this use in the past. The ban does not apply the using antibiotics to treat animal diseases — only to their routine use in feeds. It was triggered by concerns over laboratory tests showing that a Dutch poultry farmer had become infected with the same antibiotic-resistant bacteria found in his chickens.

Canada’s health department has called for a voluntary reduction in the amount of antibiotics used in agriculture, but is considered unlikely to ban their use. Instead, experts there say they would prefer to evaluate each drug individually to see if the benefits outweigh the risks.

*A U.S. ban on growth-promoting antibiotics in hog feed would increase disease-treatment costs by \$4.50 per pig per year (\$700 million over 10 years).
— 2003 Iowa State University study*

Recent actions taken by the 15-nation European Union may stem from the outbreak of mad cow disease in Britain in the 1990s.

¹⁵ Dermot J. Hayes and Helen H. Jenson. “Lessons from the Danish Ban on Feed-Grade Antibiotics,” Briefing Paper 03-BP 41, June 2003, Center for Agricultural and Rural Development, Iowa State University (www.card.iastate.edu).

¹⁶ WHO, Executive Summary to *Impacts of antimicrobial growth promoter termination in Denmark*.

Sources of Additional Information

American Veterinary Medical Association
1931 North Meacham Road,
Suite 100
Schaumburg, IL 60173
847-925-8070
www.avma.org

Animal Health Institute
1325 G Street N.W.
Washington, DC 20005
202-637-2440
www.ahi.org

Centers for Disease Control and Prevention
Food Safety Office
404-639-2213
www.cdc.gov/foodsafety

FDA Center for Food Safety and Applied Nutrition
5100 Paint Branch Parkway
College Park, MD 20740-3835
Information line: 1-888-SAFEFOOD
<http://vm.cfsan.fda.gov>

FDA Center for Veterinary Medicine
7519 Standish Place, HFV-12
Rockville, MD 20855
301-827-3800
www.fda.gov/cvm

National Antimicrobial Resistance Monitoring System
www.cdc.gov/narms

USDA Food Safety and Inspection Service
Food Safety Education Staff
5601 Sunnyside Avenue
Beltsville, MD 20705
301-504-9605
www.fsis.usda.gov