**Antimicrobial use and antimicrobial resistance pet owner FAQ**

Antimicrobial use and antimicrobial resistance are complex issues, and there's a lot of confusion and misinformation in the media and on the Internet. These FAQs clear up some of the confusion and provide you with science-based information to help you make educated decisions about antibiotics and other antimicrobial drugs.

Q: What are microorganisms?

A: Microorganisms are living organisms that are too small to be seen individually by the naked eye. They include bacteria, viruses, protozoa, and some fungi and algae. You might see with your naked eye a group of these organisms – such as a mold growth on bread – but you need a microscope to see individual microorganisms.

Q: What are antimicrobials?

A: Antimicrobials [anti (against) + mikros (little) + bios (life)] are products that kill microorganisms or keep them from multiplying (reproducing) or growing. They can be either naturally occurring or synthetic (manmade) and are most commonly used to prevent, control, or treat diseases and infections caused by microorganisms. Various groups of antimicrobials kill different types of microorganisms: bacteria (antibacterial), fungi (antifungal), viruses (antiviral), or protozoa (antiprotozoal).

Q: What's the difference between an antibiotic and an antimicrobial?

A: Antibiotics [anti (against) + bios (life)] are antimicrobials that can kill bacteria or inhibit their growth or reproduction. All antibiotics are antimicrobials, but not all antimicrobials are antibiotics.

Penicillin is a classic example of an antibiotic: it is produced by Penicillium fungi and has the ability to kill a variety of bacteria. Therefore, it is an effective antibiotic when used appropriately to treat infections susceptible to it.

Q: What does "susceptible" mean when it comes to antimicrobials?

A: The term "susceptible" simply means that a microorganism is capable of being affected by the antimicrobial. For example, if a type of streptococcus bacteria is said to be susceptible to penicillin, it means that penicillin can either kill the bacteria, or slow or stop their growth.

Q: Are the antimicrobials used in animals the same ones used in people?

A: Antimicrobials and antibiotics are grouped in "classes" based on how they affect the bacteria, viruses and fungi they're used to combat. The vast majority of antibiotic classes are used in both people and animals. Only a few classes are specific to either human medicine or veterinary medicine. However, there are classes of antibiotics that are considered "medically important to human medicine."

Many antimicrobials used in human medicine are not approved for use in animals or are, quite simply, too expensive to use in animals.

Regarding the antimicrobials used in food production, some of those also are used in people, and some are not. Strict federal regulations govern the use of antimicrobials in food-producing animals, including the specific antimicrobials that can be used. The U.S. Food and Drug Administration (FDA) is responsible for approving antimicrobials and other medications for use in animals, including antimicrobials that may be added to the feed of food-producing animals. In addition, several states have enacted laws which limit how certain antimicrobials may be used and/or have a reporting requirement of veterinarians.

Q: What is antimicrobial resistance?

A: Antimicrobial resistance (including antibiotic resistance) occurs when a microorganism develops the ability to resist the action of an antimicrobial that previously affected it. Basically, the microorganism develops the ability to survive and reproduce despite the presence (and dose) of the antimicrobial.

"Resistance" can occur only in an organism that used to be susceptible to an antimicrobial's effects but now is not. The term doesn't apply to an organism that was never susceptible to that antimicrobial.

How resistance develops is a very complex process, and we don't really know all of the factors or events that can make it happen. We do know that an organism can undergo a change in its DNA that makes it resistant to one or more antimicrobials, and this change might be passed on to its offspring or transferred to another organism. The DNA change might just be a natural mutation, or it might be in response to something else, such as the use of antimicrobials.

Q: What causes antimicrobial resistance?

A: Current science can't really prove what causes all of the different types of antimicrobial resistance that create public health risks.

Antimicrobial resistance can be caused by "selection pressure." Regardless how effective an antimicrobial might be, rarely—if ever—will 100% of the organisms be killed during a course of treatment. This means that at least one organism out of thousands may have developed resistance to the antimicrobial. The few surviving and potentially resistant organisms could then transfer their genetic material to offspring or even to other unrelated organisms.

There are also some who say that antimicrobial resistance can be caused by widespread use of antimicrobials in animals. Their argument is that the more antimicrobials are used in animals, the more we expose the organisms to the antimicrobials and give them the opportunity to develop resistance. Although that may be true in a very simplified, general sense, the scientific evidence showing how, if or to what extent such exposure affects human health remains unclear.

The assumption that simply giving antimicrobials to a larger number of animals creates a public health hazard due to resistance isn't accurate, because it doesn't account for the benefits of preventing disease and the need for higher doses and potentially stronger types of antimicrobials if an animal is sick. A part of veterinary medical education is understanding how antimicrobials affect microorganisms and how they can be used responsibly to protect human and animal health.

Q: Is all antimicrobial resistance a threat to public health?

A: Antimicrobial resistance is only a threat to public health when humans are infected with a resistant organism that is difficult or impossible to treat. This is an issue seen more frequently with human pathogens transmitted between humans – such as extremely drug-resistant tuberculosis (XDRTB) and MRSA. While outbreaks of resistant foodborne pathogens have been reported, very few have been epidemiologically traced back to the farm. Even fewer have been traced to a specific antimicrobial use.

Q: How are antimicrobials used in animals?

A: Antimicrobials are generally used to prevent, control, or treat infection in animals much like they are used in human medicine. For example, a physician or veterinarian might administer or prescribe an antimicrobial to treat skin, bone, or systemic infections. They also might be used before surgery to prevent postoperative infection.

In research settings, antimicrobials are used to control or treat disease, just as they are in other animal populations. Antimicrobials are sometimes used in other ways unique to research, such as to create a model of disease for research purposes or to study how diseases develop. Research is also conducted on antimicrobials themselves to establish their pharmacologic activity or efficacy.

In food production systems, healthy animals make healthy food, and veterinarians are on the frontlines in keeping our nation's food supply safe. Advances in animal health care and management have greatly improved food safety over the years and have reduced the need for antimicrobials in food production. However, antimicrobials are an important part of the veterinarian's toolkit, and veterinarians agree that they should be used judiciously and in the best interest of animal health and public health.

The U.S. Food and Drug Administration (FDA) approves the use of antimicrobials for four purposes:

* *Preventing disease*: There is a known disease risk present, and antibiotics are administered to prevent infection of animals.
* *Controlling disease*: Disease is present in a percentage of a herd or flock, and antibiotics are administered to decrease the spread of disease in the flock/herd while clinically ill animals are treated.
* *Treating disease*: Antibiotics are administered to treat sick animals.
* *Promoting growth / feed efficiency*: Only antimicrobials that are not considered important to human health can be used in food animals for this purpose. Since the Veterinary Feed Directive took effect on Jan. 1, 2017, medically important antimicrobials cannot be used for growth promotion or feed efficiency.

Q: How do veterinarians decide what antimicrobials to use?

A: When antimicrobials are needed to treat an animal, veterinarians base their choices on many factors, including:

* Type of infection
* The organism causing the infection and its susceptibility to the antimicrobial
* How the antimicrobial is administered (for example, whether it's given orally or by injection) and how that will be tolerated by the animal
* Whether or not it is approved for use in that animal species
* Risk of side effects
* Cost

Q: Where do food producers get antimicrobials for animals?

A: Producers obtain antimicrobials from their veterinarian with a prescription. In addition, animal feed can be formulated with an antimicrobial when there is a Veterinary Feed Directive (VFD) directing the feed mill to add a specific antimicrobial to the feed at a specific dose. VFDs require the existence of a [veterinarian-client-patient relationship (VCPR)](https://www.avma.org/KB/Policies/Pages/Guidelines-for-Veterinary-Prescription-Drugs.aspx). Simply put, a VCPR is established when a veterinarian examines an animal patient (or flock or herd), and there is an agreement between the client and the veterinarian that the veterinarian will provide medical care for the animal(s).

There also are a few antimicrobials that are available over the counter for food animals. Like other over-the-counter drugs, they can be used only according to the instructions on the label. Some states are going to bar the sale of these over-the-counter antimicrobials; California banned these starting in 2018. The FDA has announced these over-the-counter drugs will soon require a prescription, as detailed in the FDA's five-year plan, [Supporting Antimicrobial Stewardship in Veterinary Settings Goals for Fiscal Years 2019 – 2023](https://www.fda.gov/media/115776/download).

Q: How does antimicrobial use in animals differ from that in humans?

A: In human medicine, antimicrobials are approved for disease treatment and prevention, and physicians can prescribe and use antimicrobials without restrictions as to dose and duration of treatment. In veterinary medicine, antimicrobials used in food-producing animals are approved for disease treatment, control, and prevention. (See ["How are antimicrobials used in animals?"](https://www.avma.org/KB/Resources/FAQs/Pages/Antimicrobial-Use-and-Antimicrobial-Resistance-FAQs.aspx#used-in-animals) for descriptions of these uses).

Antimicrobials, like all other drugs given to food animals, must be used according to approved label directions or according to federal regulations. In fact, many of the drugs shared by both human and veterinary medicine are restricted to a very specific veterinary use, dose, and duration, and can be administered to animals only by a veterinarian.

Q: How can an antimicrobial be a "growth promoter?"

A: Antimicrobials can change the balance of bacteria in an animal's intestine in such a way that it makes it easier for the animal to absorb nutrients. Medically important antimicrobials can no longer be used for growth promotion and feed efficiency as of January 1, 2017 when the Veterinary Feed Directive went into effect.

Q: I've heard the phrase "nontherapeutic use of antimicrobials"—what does that mean?

A: "Nontherapeutic" is a term that is used inappropriately by some groups to describe the use of antimicrobials in animals for disease prevention and other purposes. These groups feel that antimicrobials should only be used when animals show clinical signs of a disease. Neither the FDA nor the AVMA uses this term.

Q: How frequently are antimicrobials used in food production?

A: Lots of numbers have been thrown out there by various groups and the media, but the reality is that no one really knows. There is no mechanism to track the frequency of antimicrobial use in food production. What's more important are:

* judicious use of antimicrobials
* determining if the use of a specific drug is causing an impact on the development of resistance that is significant to animal and/or human health

Q: What's the bigger risk for causing antimicrobial resistance—antimicrobial use in humans or use in livestock?

A: This is a matter of debate. The simple truth is that no one really knows. It's common sense to think that both uses might contribute to the formation of resistance in some way, but risk assessments have shown that the use of antimicrobials in food production systems plays an extremely small role.[1](https://www.avma.org/KB/Resources/FAQs/Pages/Antimicrobial-Use-and-Antimicrobial-Resistance-FAQs.aspx#references)

No matter how small the risk, the AVMA wants to assure the judicious use of antimicrobials, which is why we support limiting their use to activities that prevent, control, or treat disease.

Q: Should I be concerned about antimicrobial resistance?

A: Of course you should—we should all be concerned about antimicrobial resistance.

The connection between specific antimicrobial uses in food animals, and foodborne or other human disease, remains unclear. Based on studies to date, the risk to people of becoming infected with resistant organisms by consuming animal products (meat, milk, eggs) is extremely low.

Veterinarians are concerned about the development of antimicrobial resistance in organisms that infect animals because it may compromise the effectiveness of antimicrobial therapy for animal diseases and make them harder to treat. Antimicrobials are needed for the relief of pain and suffering caused by bacterial diseases in animals as well as in people.

Q: Why can't we just stop using antimicrobials in food-producing animals?

A: Eliminating antimicrobial use in food-producing animals, or even placing more stringent restrictions on their use, would remove a valuable tool in the veterinarian's kit for preventing and reducing animal disease and suffering. Healthy animals mean healthy food products, and antimicrobials help veterinarians keep animals healthy.

Veterinarians and the AVMA support the judicious use of antimicrobials. What does this mean? It means that anyone using antimicrobials—whether in people, animals or the environment—should use good judgment and base this decision on maximizing good outcomes and minimizing the risk of resistance. If scientific research and risk-based assessments demonstrate that the use of an antimicrobial poses significant public health risks, we support the restriction or removal of its use. The FDA can remove a product or place additional restrictions on its use in animals if the product poses a public health risk. In 2005, the FDA did just that—[announcing](https://www.fda.gov/animal-veterinary/recalls-withdrawals/withdrawal-enrofloxacin-poultry) that the antimicrobial enrofloxacin could no longer be used in poultry because of an increased risk to public health. To date, there has not been any proof that currently approved antimicrobials pose a special public health risk.

The continued availability of safe, effective antimicrobials for veterinary medicine, including the retention of currently approved drugs and future approvals of new drugs, is critical to maintaining a safe food supply as well as preserving animal health and welfare.

Q: You say that banning antimicrobials could have negative effects on animal welfare. Why?

A: Animal welfare means the physical and mental state of an animal in relation to the conditions in which it lives and dies. One part of meeting an animal's primary welfare needs is to provide freedom from pain, injury and disease. Banning or severely restricting the use of antimicrobials in animals may reduce the veterinarian's ability to protect animal health and prevent suffering from disease, which can lead to poor welfare.

Q: You say that banning antimicrobials could have negative effects on the safety of our food. Why?

A: Healthy animals provide healthy food. Banning or severely restricting antimicrobial use limits veterinarians' ability to treat, prevent or control animal diseases. Treating, preventing, and controlling disease in food animals ensures that we have healthy animals entering the food supply, so the veterinarians who care for food animals need access to antimicrobials as part of their toolkit to combat disease. This is necessary to protect public health and is a judicious use of antimicrobials. Allowing the judicious use of antimicrobials to treat, prevent, and control disease in food animals lowers the risk of unhealthy animals entering our food supply.

Q: What are veterinarians doing to prevent antimicrobial resistance?

A: Veterinarians use pharmaceuticals, including antimicrobial agents, judiciously. It is important to recognize that veterinarians are trained professionals who know when antimicrobials are needed in animals and when they are not. We also work with food producers to keep the animals healthy with vaccination, parasite treatment, good nutrition and good management practices.

For more information on the AVMA's philosophy regarding antimicrobial use, read our policy on the [Judicious Therapeutic Use of Antimicrobials](https://www.avma.org/KB/Policies/Pages/Judicious-Therapeutic-Use-of-Antimicrobials.aspx).

Q: What are food producers doing to prevent antimicrobial resistance?

A: Keeping animals healthy is the main goal. After all, sick animals aren't allowed to enter our food chain. Strategies needed to keep animals healthy include vaccination, parasite treatment, good nutrition, and good management and husbandry to reduce stress and minimize the risk of disease.

It's also reasonable to expect producers to use antimicrobials judiciously. When producers use antimicrobials and other medications, they are required to follow the label directions, which include the amount of time the producer must wait after the last dose before either the animal or its milk can be used for food. That's called the withdrawal time, and during that period the animal's milk must be discarded and the animal cannot be slaughtered. The withdrawal times are based on how the body processes the medications. Observing them ensures that there are no drug residues in the milk or meat.

Q: What is the federal government doing to prevent antimicrobial resistance?

A: Antimicrobial use is regulated by the FDA. In addition to approving the use of antimicrobials in animals, the FDA also collects data on antimicrobial sales from companies and makes that information publicly available.

The National Antimicrobial Resistance Monitoring System (NARMS), established by the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA), performs research and provides information about antimicrobial resistance in people, animals and retail meats. The USDA also funds research on antimicrobial resistance.

FoodNet is a foodborne illness surveillance network and is a cooperative effort of the U.S. Centers for Disease Control and Prevention (CDC), FDA, USDA and members of the Emerging Infections Program. The system collects information about foodborne diseases and related illnesses.

In September 2014, President Barack Obama signed Executive Order 13676 establishing the Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria (PACCARB). The council provides advice, information, and recommendations to the secretary of Health and Human Services regarding programs and policies related to antibiotic resistance. These include both a national strategy and action plan for combating antibiotic-resistant bacteria.

Q: What can I do to prevent antimicrobial resistance?

A: One very simple thing you can do is to avoid requesting antimicrobials if you have the flu or a cold. Because colds and the flu are caused by infection with viruses, antibiotics won't help. Antimicrobials should only be prescribed if your physician feels they are absolutely necessary. If your physician determines that you need to be given antimicrobials, make sure you follow the directions and take the right doses at the right times for the right number of days as prescribed – don't skip doses, don't take antimicrobials prescribed for someone else, and don't save any antimicrobials for later use.

Similarly, trust your veterinarian to determine when and if your animals need treatment with antimicrobials.

Q: Doesn't Europe ban the use of antimicrobials?

A: The European Union does not have a ban on the use of antimicrobials – they have bans on the use of antimicrobials for the purpose of growth promotion. Sweden banned all growth promotants in 1986. Denmark instituted antimicrobial-specific bans in 1995 and 1998, and added a ban on all growth promotants in 2001. The Netherlands banned growth promotants in 2006, and the European Union banned one growth-promoting antimicrobial in 1997 and others in 1999. The European Union uses the same definitions of antibiotic use as the AVMA and FDA (see ["How are antimicrobials used in animals?"](https://www.avma.org/KB/Resources/FAQs/Pages/Antimicrobial-Use-and-Antimicrobial-Resistance-FAQs.aspx#used-in-animals)) and does not allow growth promotion. The other uses of antibiotics – prevention, control, and treatment – remain, with greater flexibility for the veterinarian to determine doses than the FDA allows for veterinarians in the United States.

Q: What is PAMTA?

A: PAMTA is the Preservation of Antibiotics for Medical Treatment Act, a proposed federal law (H.R. 1587). Its stated purpose is to preserve the effectiveness of medically important antimicrobials used to treat human and animal diseases by eliminating so-called "nontherapeutic" use of antibiotic drugs considered important for human health. The bill defines "nontherapeutic use" as the use of a drug administered in an animal's feed or water in the absence of any clinical signs of disease for the purpose of growth promotion, improved feed efficiency, increased weight gain, routine disease prevention, or other routine purposes. It seeks to restrict the use of many classes of antibiotics—including penicillins, tetracycline, macrolides, lincosamides, streptogramins, aminoglycosides, sulfonamides or any other drug or derivative of a drug that is used to prevent, control, or treat disease or infection in people.

Q: Does the AVMA support PAMTA? Why or why not?

A: No, the AVMA does not support PAMTA. Although PAMTA may seem simple at first glance, we don't support broad bans that aren't based on science – and this one isn't. Banning the use of these antibiotics before science-based studies and risk-based evaluations show if there is an actual risk to human health would harm animal health and could put food safety at risk.

This ban would be much more restrictive than Denmark's ban, as it would eliminate two or three of the four currently approved uses of antibiotics. It would allow antimicrobial use only for treatment purposes, which would mean antimicrobials could only administered after an animal has become physically ill and its health and welfare have been compromised. Another critical, and often overlooked, difference between Denmark and the United States is the flexible drug labeling system used by EU countries. In the United States, drugs are approved by the FDA at specific doses for specific uses—a drug might be labeled with one dose for growth promotion, a second for prevention, a third for disease control and a fourth for disease treatment. In the EU, drugs are labeled with one wider range of accepted dosages, allowing more flexibility in dosage selection.

Neither the Netherlands' nor Denmark's antimicrobial ban has resulted in decreased antimicrobial resistance in humans. In addition, a study performed in the Netherlands concluded that the therapeutic use of antimicrobials in food animals nearly doubled in the decade after the ban took effect. One of the likely factors in that increase is the ban on the use of antimicrobials for growth promotion.[2,4](https://www.avma.org/KB/Resources/FAQs/Pages/Antimicrobial-Use-and-Antimicrobial-Resistance-FAQs.aspx#references)

Q: What is the solution?

A: Antimicrobial resistance doesn't happen overnight, and neither does the solution. First and foremost, we need more discussion, more research, and more risk-based analyses. We need more data to determine the risks and the best measures to reduce or eliminate those risks while also weighing the benefits of antimicrobial use. This includes science- and risk-based evaluation of antimicrobials to determine their appropriate use and/or continued approval.

Following the best available methods for managing food-producing animals, with continual evaluation and improvement when possible, keeps animals healthier and decreases the need for antimicrobials.

Collaboration and coordination among government, food producers and other stakeholders is vital. Everyone should take responsibility for the part they may play in the development of antimicrobial resistance and take steps to address it.

We also need more veterinarians working in food supply veterinary medicine, making sure our food is safe from farm to fork.

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