

Antibiotics are used in food animal production. Understanding the basics provides information for accurate communication to address inquiries from consumers about how their food is produced, including the use of antibiotics in food animal agriculture.

## What are antibiotics and antimicrobials?

The words antibiotics and antimicrobials are often used interchangeably but scientifically each has a specific meaning and definition.

- **Antimicrobials** — the broadest term used — refers to any product that has activity against a variety of microorganisms, which can include bacteria, viruses, fungi and parasites
- **Antibiotics** are a type of antimicrobial. Specifically, antibiotics kill or inhibit the growth of bacteria that cause disease in humans or animals.

Antibiotics are a type of antimicrobial, but not all antimicrobials are antibiotics.<sup>1</sup> Antibiotics pertain almost exclusively to bacteria, while antimicrobials are simply a bigger category of medicines that fight a bigger range of bugs.

## Types of antibiotics

Antibiotics are categorized based on how they are used. These categories are important because they help us separate antibiotics that are used only in animals from those that are shared with humans or used only in humans.

**Figure 1. Three categories of antibiotics.**

### Human & Animal antibiotics:



Some antibiotics help humans and animals. These should be used only for therapeutic needs in animals and only with veterinarian oversight.

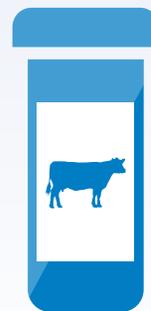
**Shared Class**  
(medically important for both humans and animals)

### Human-only antibiotics:



These are antibiotics that are not approved for use in animals.

### Animal-only antimicrobials:



Animals are susceptible to different diseases and have different health requirements than humans. These antibiotics have been developed to treat animals only and are not used in human medicine.

## Why do we need antibiotics?

Bacteria, viruses and microbes are found everywhere in the environment, which means animals are exposed to disease throughout their lives whether they're raised outdoors or indoors.

Antibiotics, used responsibly, along with good animal-care practices, help improve food safety, animal health and welfare, and sustainability. Using antibiotics responsibly means treating an animal that is sick with the right type of medicine, at the right dose and at the right time. Veterinarians and farmers use antibiotics for animals in four ways:

1. To treat animals diagnosed with an illness
2. To control the spread of illness in a herd or flock
3. To prevent illness in healthy animals when exposure is imminent
4. To improve production efficiency through a better balance of good and bad bacteria for improved nutrition

Veterinarians in coordination with farmers, decide how best to treat sick animals and control disease, but antibiotics are not the only tool used to maintain animal health — there are many options available. Proper nutrition, hygiene and housing need to be considered first, then the appropriate use of antibiotics, vaccines, enzymes or anti-parasitics is determined.

Figure 2. The uses of antibiotics.

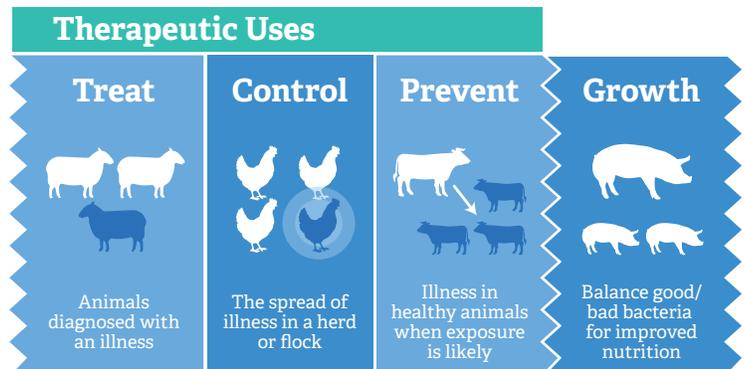
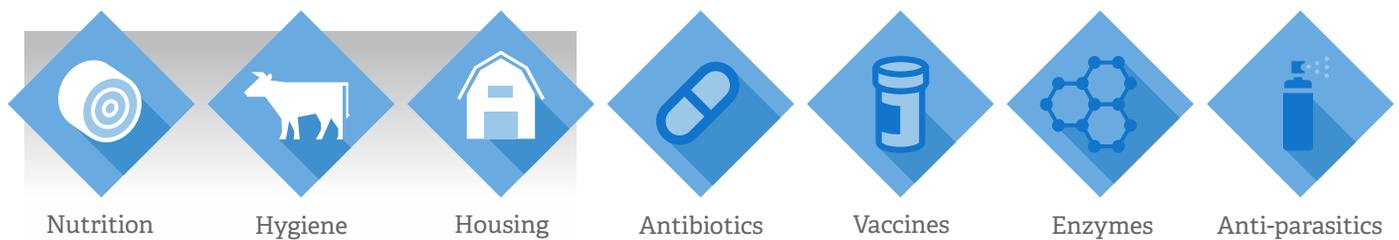


Figure 3. Tools that help improve animal health.



## What is antibiotic resistance?

Resistance occurs naturally in the environment all the time as a defense mechanism in bacteria. It is a natural biological process of bacterial survival and the bacterial defense against antibiotic drugs designed to kill them. The resistance process alone is complex and occurs over time. Further, the resistance-transfer process — meaning the transfer of antibiotic resistance to humans — is even more complex, involving a nine-step process to create animal-derived foodborne resistance. Antibiotic resistance and resistance transfer to humans are not the same, but rather two separate events. For animal-derived resistance, first resistance needs to develop, then the resistance can be transferred to humans via food.

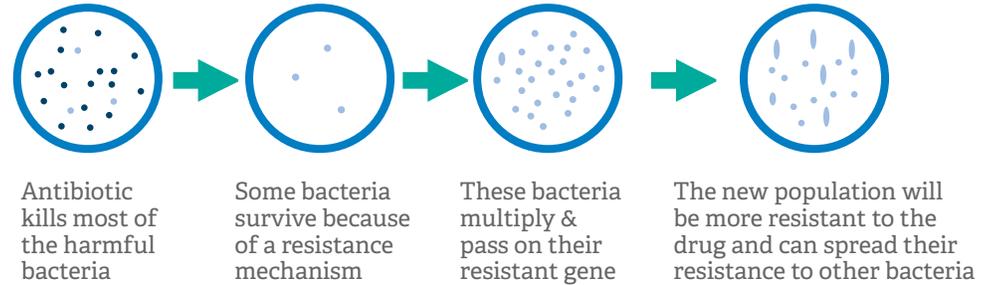
**Figure 4. The process of antibiotic resistance development.**<sup>3</sup>



**Antibiotic Resistance**

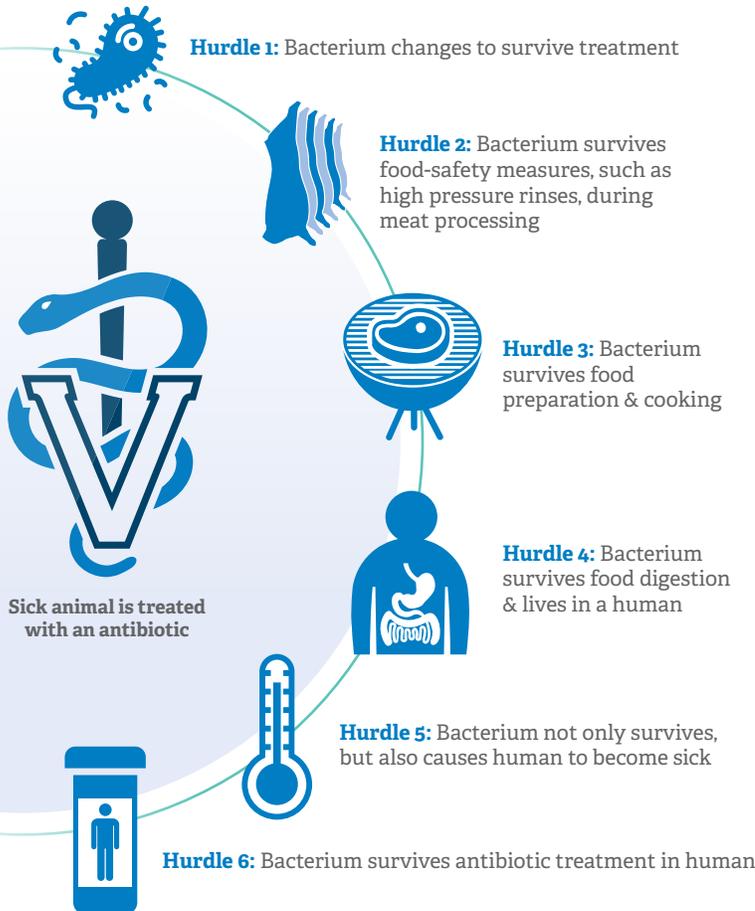
Resistance of a bacteria to an antibiotic drug that was originally effective at treating infections caused by it.

**How does antibiotic resistance occur?**



Resistance will not develop each time an antibiotic is used, but the more an antibiotic is used, the more chances there are for resistance to develop

**Figure 5. Hurdles involved in antibiotic resistance development and transfer.**



According to risk-assessment studies, the chance of bacterial resistance in humans being caused by raising animals with antibiotics is extremely low, but still important to minimize. For example, independent research shows that the chance of a person having just one additional day of illness due to treatment failure resulting from resistance transfer from *Campylobacter* bacteria caused by eating pork is less than one in 53 million.<sup>2</sup> By comparison, the chance of being struck by lightning in your lifetime is one in 3,000.<sup>4</sup>

Today's food production system has many regulations and practices in place to significantly reduce the already-low likelihood that a person could acquire a foodborne bacterial disease that does not respond to treatment. The appropriate use of antibiotics in food-animal production poses an extremely low risk while creating animal wellness and food safety benefits throughout the food chain, all the way to the consumer.

## Are foods from animals treated with antibiotics safe to eat?

Yes, meat and other foods derived from animals administered antibiotics are safe.

Antibiotics are highly regulated and closely monitored by national governmental regulatory authorities. These authorities require antibiotics to meet strict standards for human food safety, animal safety, environmental safety and effectiveness.

Government authorities are responsible for the monitoring of meat and dairy products during the production and food-chain process through random sampling and laboratory testing to assure their safety. Veterinarians also work with farmers to implement quality standards, while meat packers and processors must adhere to their own strict government-regulated standards.

International food standards set by the Codex organization, and standards established by national regulatory authorities, through monitoring and enforcement ensure meats do not contain unsafe residues of antibiotics. National authorities oversee the testing of meat and milk; if unsafe antibiotic residues are found, then that meat or milk is discarded and never reaches the consumer. In addition, national controls require withdrawal of antibiotics from animals for a specified period prior to processing meat or milk. Multiple steps are in place through regulation and production practices to provide safe food to consumers.

Internationally, the World Veterinary Association, the World Organization for Animal Health and other groups have developed unified guidelines for the use of antibiotics in food animals called the *Prudent Use of Antibiotics: Global Basic Principles*.<sup>5</sup>

### **Codex International Food Standards establishes global standards designed to:**

- Help developing countries assure food safety with less regulatory burden
- Provide reference standards for global trade



## Global Market Access

<sup>1</sup> AVMA. 2015. "Antimicrobial use and antimicrobial resistance FAQ." Accessed Oct. 27, 2015. <https://www.avma.org/KB/Resources/FAQs/Pages/Antimicrobial-Use-and-Antimicrobial-Resistance-FAQs.aspx>.

<sup>2</sup> Hurd, H.S., S. Doores, D. Hayes, A. Mathew, J. Maurer, P. Silley, R.S. Singer, and R.N. Jones. 2004. "Public Health Consequences of Macrolide Use in Food Animals: A Deterministic Risk Assessment." *J. Food Protect.* 67:5:980-992.

<sup>3</sup> European Food Information Council. "European Antibiotic Awareness Day 2014 - Antibiotic Resistance infographic." Accessed Nov. 10, 2015.

<sup>4</sup> National Geographic. 2005. "Flash facts about lightning." Accessed Nov. 10, 2015. [http://news.nationalgeographic.com/news/2004/06/0623\\_040623\\_lightningfacts.html](http://news.nationalgeographic.com/news/2004/06/0623_040623_lightningfacts.html).

<sup>5</sup> WVA. "Prudent use of antibiotics: Global basic principles." Accessed Nov. 10, 2015. <http://www.poultry-health.com/library/antimicrobials/wvacoifa.htm>.