مجلس الصحة
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Gulf Health Council

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Time it right



Awareness Guide
Antimicrobial Resistance

Contents

The Concept of the One Health Approach and Its Impact	03
What Are Antimicrobials?	05
What Is Antimicrobial Resistance and Why Is It Dangerous?	06
Why Can Antimicrobial Resistance Not Be Addressed by a Single Sector?	07
Appropriate Use to Prevent Antimicrobial Resistance	08
Antimicrobial Resistance in the Animal Sector	12
How Do We Protect Ourselves and Our Animals?	14
Food and Environmental Safety	15
Groups Most Vulnerable to Complications of Antimicrobial Resistance	16
The Role and Importance of Vaccines	17

The Concept of the One Health Approach and Its Impact

One Health

An integrated, unifying approach that aims to achieve the optimal balance between the health of humans, animals, plants and ecosystems by integrating these fields rather than dealing with each of them in isolation. This approach leverages the close and interdependent links between these fields to create new methods for epidemiological surveillance and disease control.

The health of humans, animals and ecosystems is closely interconnected, and any change in these relationships can increase the risk of new diseases emerging and spreading in humans and animals.

More than 60% of the emerging infectious diseases reported .worldwide originate from animals, whether wild or domestic



In practice, the One Health approach covers a wide range of interconnected issues



Antimicrobial resistance (AMR):

when microbes develop the ability to resist the medicines designed to eliminate them

Zoonotic diseases

infectious diseases transmitted between animals and humans, such as Ebola, avian influenza and rabies

Vector-borne diseases

such as dengue fever, West Nile virus, Lyme disease and malaria.

Food safety and foodborne diseases

such as norovirus, Salmonella and Listeria, resulting from food contamination at any stage of production, distribution and consumption

Environmental issues

such as water and air pollution and climate change.

What Are Antimicrobials?

Medicines used to prevent and treat infectious diseases in humans, animals and plants. They mainly include antibiotics, antivirals, antifungals and antiparasitics.

Antibiotic resistance, on the other hand, refers specifically to the resistance of bacteria to antibiotics, and therefore represents one component of the broader concept of antimicrobial resistance.



How Resistant Microbes Are Transmitted

Resistant microbes and resistance determinants can be transmitted through multiple, interconnected pathways between humans, animals, food and the environment. This interconnection allows resistance to spread within the community and healthcare facilities, and through the food chain and ecosystems, making antimicrobial resistance an issue that extends beyond the boundaries of a single health sector.

a) Person-to-Person Transmission

- Direct contact between people (touching, handshaking, caring for a patient)
- Indirect transmission through respiratory droplets, such as from coughing or sneezing
- Transmission in healthcare facilities and hospitals

b) Animal-to-Human Transmission (Zoonotic Diseases)

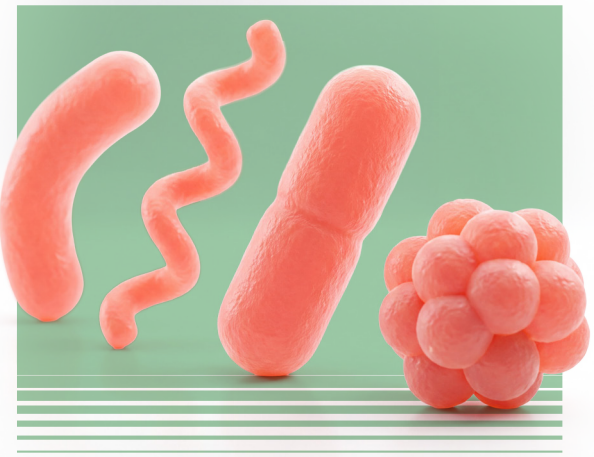
- Direct contact with animals, whether on farms, with pets or with wildlife
- The food chain: transmission of resistant bacteria through contaminated meat, dairy products and vegetables, particularly when proper hygiene and cooking practices are not followed “from farm to fork”
- The impact can be transmitted in both directions: from animals to humans and from humans to animals as well

c) Transmission through the Environment

- **Water:** waste from hospitals and farms and untreated sewage are discharged into rivers and groundwater sources, carrying with them resistant bacteria and resistance genes that can reach humans through drinking water, swimming or irrigation
- **Soil and agriculture:** the use of animal waste (organic manure) and sewage sludge as fertilizers introduces antibiotic residues and resistance genes into the soil, which in turn pass to agricultural crops
- **Air:** resistant bacteria can be transmitted through aerosols generated by farms and waste treatment facilities

What Is Antimicrobial Resistance and Why Is It Dangerous?

It is a phenomenon that occurs when microorganisms, including bacteria, viruses, fungi and parasites, undergo changes that enable them to survive or multiply despite exposure to antimicrobial medicines that were previously effective against them. In other words, it is the microorganisms that change and develop defense mechanisms to withstand the medicine and continue to survive.
This leads to reduced effectiveness of available treatments, greater difficulty in treating infections, and an increased likelihood of their persistence and transmission, with the associated higher risk of severe illness, disability and death



Estimates indicate that bacterial antimicrobial resistance was associated with approximately 4.71 million deaths worldwide in 2021, of which approximately 1.14 million deaths were directly attributable to resistance.

Antimicrobial resistance has wide-ranging health, social and economic consequences

1. It limits the available treatment options
2. It may prolong illness and hospital stays and increase the need for alternative treatments
3. It threatens the effectiveness of several modern medical interventions that depend on the availability of effective antimicrobials to prevent and treat infections, including: major surgery, organ transplantation and cancer chemotherapy
4. Its impact also extends to animal health, agricultural production and food security, which underscores the need to address it through an integrated, multisectoral approach.

Why Can Antimicrobial Resistance Not Be Addressed by a Single Sector?

Health threats emerging at the human-animal-plant-environment interface have become more frequent, complex and impactful, and their effects are not limited to health alone but extend to food systems, livelihoods, trade, biodiversity and economic stability



In practice, any attempt to address antimicrobial resistance through a single sector only (for example, human health without agriculture or the environment) faces obstacles

1

Resistance genes are transferred horizontally between bacteria across entirely different species and environments (as reviewed in the section "How Resistance Emerges and Spreads"); therefore, addressing use in hospitals alone does not stop transmission arising from agricultural or environmental use

2

Lack of integrated cross-sectoral data: one of the most widely recognized gaps globally is the shortage of databases and resources supporting information exchange and joint work between the health, agriculture and environment sectors

3

Lack of a unified surveillance system: the world still lacks an integrated One Health surveillance model that brings together human, animal and environmental data in a single system that allows joint analysis

Appropriate Use to Prevent Antimicrobial Resistance

Most misuse decisions do not occur in hospitals or on farms, but in simple individual decisions that each person makes when feeling unwell.

The guidelines for the use of antibiotics are



Do not use antibiotics without a prescription

Antibiotics should be used only when prescribed by a doctor. Unnecessary or inappropriate use may cause side effects and contribute to increasing bacterial resistance to antibiotics

Do not use an antibiotic prescribed for someone else

An antibiotic is selected based on the type of infection and the suspected or confirmed bacteria, as well as the person's health condition. Therefore, an antibiotic prescribed for someone else may not be suitable or effective for the current infection and using it may delay appropriate treatment. It may also expose the person to unexpected side effects or allergic reactions

Do not use an old prescription or leftover antibiotics from a previous treatment

Even when the symptoms are similar, the cause of the current infection may be different, and therefore the antibiotic used previously may not be suitable for it. In addition, the leftover amount is often insufficient for the required treatment duration, which may lead to inappropriate treatment and a delay in obtaining proper care

Follow the prescribed instructions for use

The antibiotic should be taken according to the dose, timing and duration specified by the doctor, without changing the dose, stopping the treatment or extending it on your own

Do not keep antibiotics for later use

Leftover antibiotics should not be kept for use when you have another illness in the future; the antibiotic may not be suitable for the new infection, and the leftover amount may be insufficient for treatment

Keep up to date with recommended vaccinations

Give special priority to vaccines that have the greatest impact on reducing antibiotic use, such as the seasonal influenza vaccine and the pneumococcal vaccine, and keep your vaccinations and your children's vaccinations up to date according to the recommended schedule

Apply infection prevention practices

Regular handwashing with soap remains the simplest and most effective individual measure for reducing the transmission of infection — for example, it reduces the risk of diarrhoeal diseases by about half. Do not wait until you are admitted to hospital to apply this principle; hygiene at home, at school and at work is an essential part of the equation for reducing the need for antibiotics in the first place

Follow food safety practices

1.Cook meat, poultry and fish thoroughly, as sufficient heat kills most bacteria, including resistant ones.
2.Wash vegetables and fruits thoroughly, especially those that may be irrigated with contaminated water.
3.Avoid cross-contamination of surfaces and utensils between raw and cooked food, and store food at appropriate temperatures.

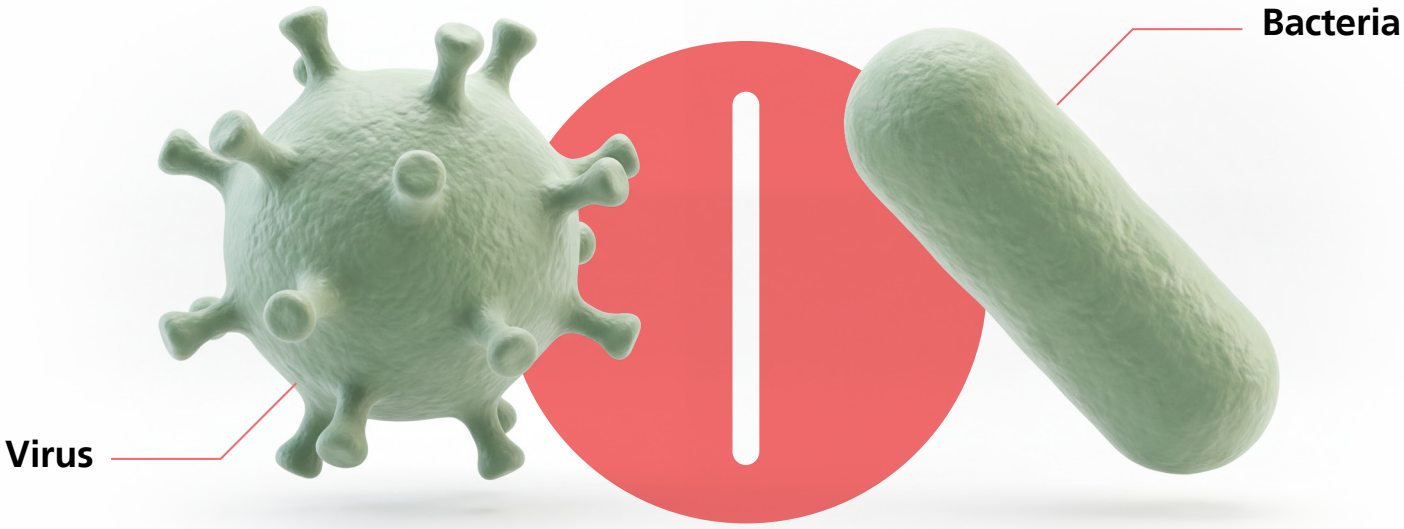
Use medicines for animals only as directed by a veterinarian

If you have a pet or farm animals, do not give them human medicine or medicine left over from a previous treatment without a veterinary prescription. Adhere to the prescribed dose and duration, keep their vaccination schedule up to date, and practise good hygiene when handling them, as every decision here directly reduces the chance of resistant bacteria being transmitted between animals and your family members

Antibiotics

When Do You Need an Antibiotic?

Antibiotics are specifically designed to kill certain types of germs called bacteria and to stop their growth. They are necessary and effective only when the infection is bacterial (confirmed or suspected by the doctor), .such as strep throat, urinary tract infections, bacterial pneumonia or tuberculosis

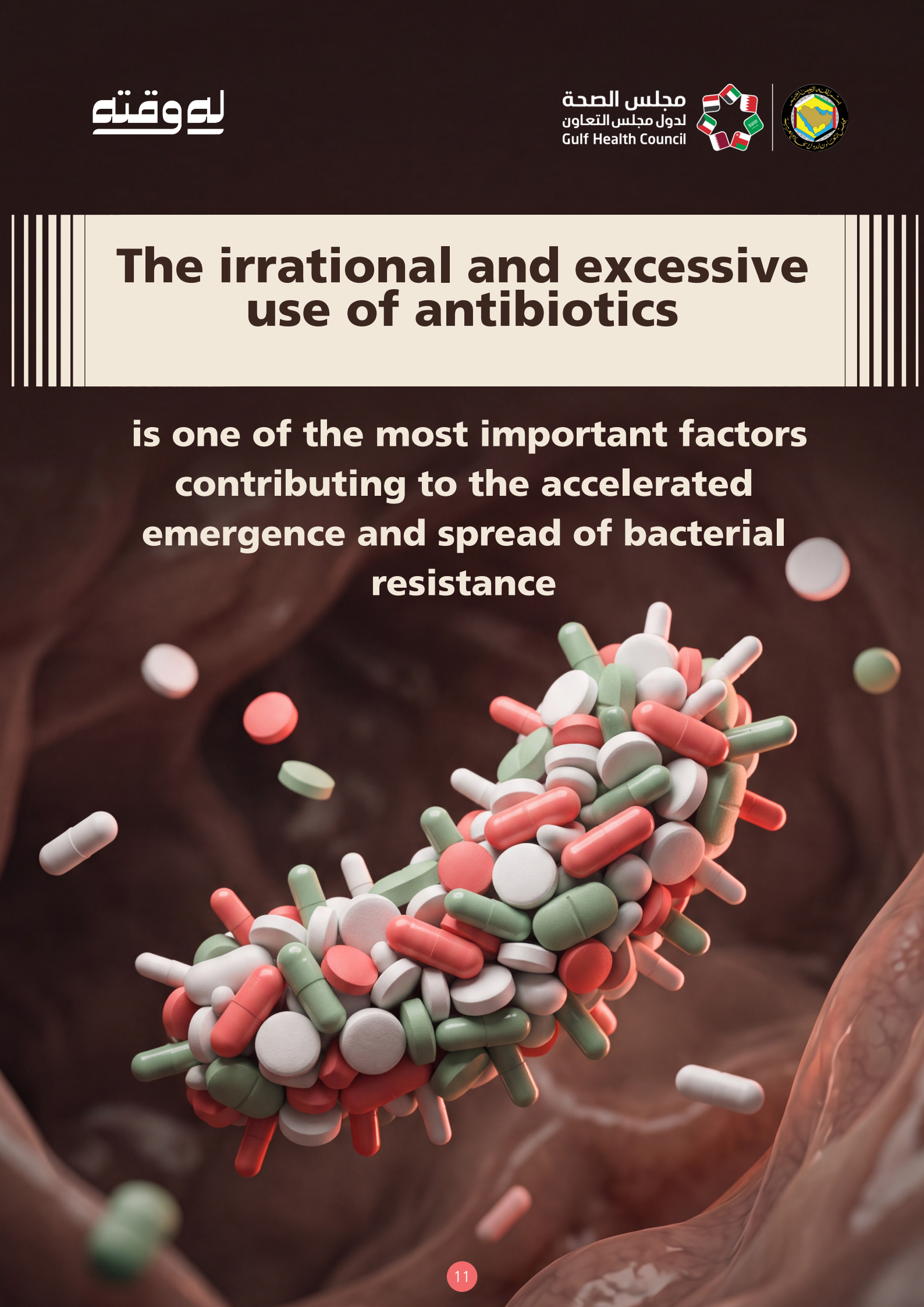


Bacterial versus Viral Infections

Viruses are germs entirely different from bacteria and cause infections such as colds and influenza; however, antibiotics do not treat viral infections at all, no matter how severe the symptoms are. Taking an antibiotic in this case will not speed up recovery; it will only expose the person to its potential side effects and contribute to accelerating the emergence of resistance without any therapeutic benefit.

The irrational and excessive use of antibiotics

is one of the most important factors contributing to the accelerated emergence and spread of bacterial resistance



Antimicrobial Resistance in the Animal Sector

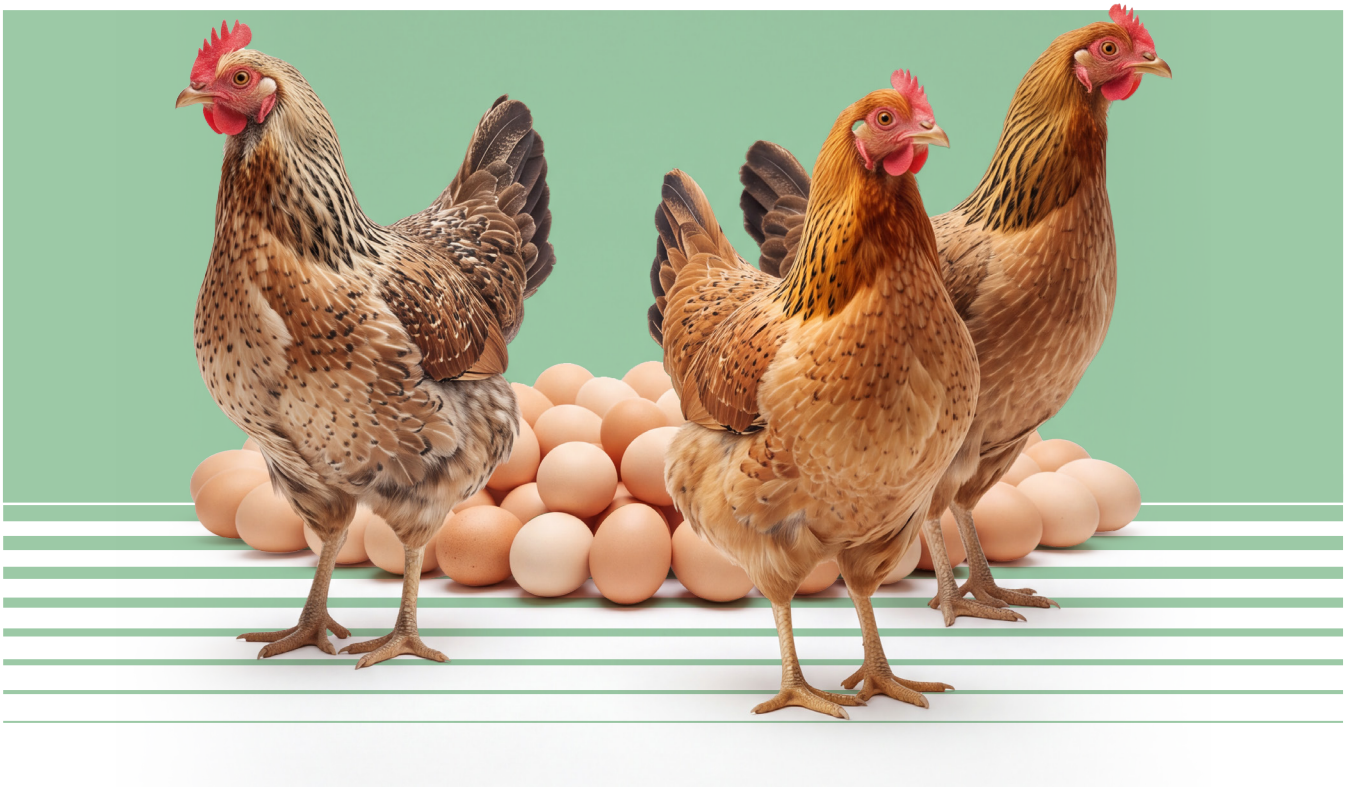


In the animal sector, antibiotics are used to treat, control and prevent bacterial infections in accordance with approved veterinary need. The excessive or inappropriate use of these antibiotics is one of the factors contributing to the emergence and spread of resistant bacteria, particularly when they are used without therapeutic necessity or in a manner inconsistent with the principles of the prudent use of antimicrobials

Veterinary Use of Antibiotics

- Requesting an appropriate examination from a specialist before starting any antibiotic treatment reduces the likelihood of giving the animal a medicine it does not need
- Do not give your animal an antibiotic from your personal medicines or from a pack left over from previous human treatment. Human doses and active ingredient concentrations may be dangerous or completely ineffective for an animal whose body is smaller or physiologically different
- Do not keep leftover antibiotics prescribed for your animal for a previous illness to use “when needed” for a new illness; the type of bacteria causing the new illness may be completely different, which delays proper treatment and increases the chance of antibiotic resistance emerging
- Adhere to the duration specified by the veterinarian, and do not stop or extend treatment without consulting them
- Complete the full course of treatment even if your animal’s symptoms appear to have improved, as stopping early gives the most resistant bacteria a chance to survive and multiply

Withdrawal Period



It is the period of time that must elapse after the last dose of an antibiotic administered to a food-producing animal before its meat, milk or eggs are allowed to enter the food chain.
This is to ensure that medicine residues fall below the maximum residue limit (MRL). Failure to observe this period is the main reason for the presence of illegal medicine residues in animal products. (٤١)
Failure to observe withdrawal periods does not result only from direct negligence; it sometimes occurs because a sick or infected animal is sold before the required withdrawal period has ended, because of double dosing through both feed and drinking water, or because of a lack of knowledge and adequate veterinary supervision among some breeders.
The deeper problem here is not only exceeding the maximum residue limit, but the spread of resistance itself through the food chain, regardless of the level of medicine residues

How Do We Protect Ourselves and Our Animals?

Pets form part of the antimicrobial resistance picture because of the close daily contact between them and humans, which may allow resistant bacteria to be transmitted in both directions

Why Does the Likelihood of Transmission Increase within Homes?

- **Contact behaviors:** Sharing a bed, kissing, and direct handling while cleaning up waste are all practices that provide a continuous pathway for bacterial transmission.
- **Antibiotic-resistant bacteria (ESBL):** A German study found that **3.6% of dogs** and **1.4% of cats** carry Escherichia coli (E. coli) bacteria that produce **ESBL** enzymes, which are enzymes that enable bacteria to inactivate commonly used antibiotics.

Therefore, the following must be observed



1.Personal hygiene

Wash your hands thoroughly with soap and water after handling animals or cleaning their equipment and waste



2.Boundaries in handling

Avoid kissing animals near the mouth or nose and provide them with separate sleeping areas away from human beds



3.Rational use of antibiotics:

Do not give antibiotics to animals except under careful veterinary supervision, to prevent the formation of new, more resistant bacterial strains

1 Food and Environmental Safety



Antimicrobial resistance is closely linked to food and environmental safety, as resistant bacteria, resistance genes and antimicrobial residues can be transmitted through multiple stages of the food chain, from animal and agricultural production, through processing, transport and handling, to the consumer. Water, soil, wastewater and animal waste also represent important pathways through which these components can be transmitted between humans, animals and the environment.



Failure to wash vegetables irrigated with contaminated water



Insufficient cooking of meat

Resistant bacteria may reach food at various stages of production, such as

1. Meat and animal products may become contaminated during slaughter or processing

2. Vegetables and crops may become contaminated as a result of using contaminated irrigation water or organic fertilizers and animal waste containing resistant bacteria or resistance genes

This may lead to these bacteria entering the food chain and ultimately reaching humans

Groups Most Vulnerable to Complications of Antimicrobial Resistance

Low immunity is a characteristic of several groups of patients, as weakened immunity is often accompanied by a decrease in the number and efficiency of white blood cells, creating a state of weakened immunity even before exposure to any infection.

Certain treatments and conditions, such as major surgery, organ or bone marrow transplantation, radiotherapy, immunosuppressive medicines used for autoimmune diseases, human immunodeficiency virus (HIV), uncontrolled diabetes and advanced age, further weaken the immune system, significantly increasing susceptibility to infection in these groups. Infections in general are among the most common causes of hospital admission for immunocompromised patients



The Role and Importance of Vaccines

Vaccines work by stimulating the immune system to recognize and fight a specific microbe before it can cause disease, whether that infection is bacterial or viral, or would later develop into a secondary bacterial infection



Vaccines reduce the need for antibiotics in two complementary ways

1. By preventing the bacterial infections themselves that would otherwise require antibiotic treatment (such as

2. By preventing viral infections (such as influenza) for which antibiotics are often prescribed without real need, or which may open the door to secondary

In this way, vaccines reduce the overall amount of antibiotic use

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