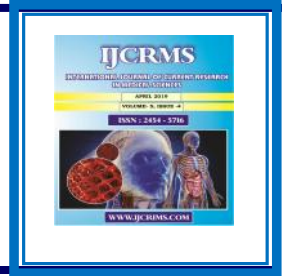




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**Review Article**

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## Antibiotic Use and Resistance

**Ashikujaman Syed,**

Department of Pharmacy, School of Pharmacy, China Pharmaceutical University;  
Nanjing, Jiangsu, Peoples Republic of China.  
E-mail: [ashik@stu.cpu.edu.cn](mailto:ashik@stu.cpu.edu.cn)

### Abstract

Infectious diseases are the major health problems in Bangladesh requiring frequently uses of antimicrobials or antibiotics. Antibiotic resistance is a worldwide problem and Bangladesh is a major contributor to this owing to its poor healthcare standards, along with the misuse and overuse on day by day. Antibiotics resistance is when bacteria can no longer be killed by the antibiotics usually used to kill. Antibiotic resistance is a growing very big problem in the United States and worldwide. Recently estimated that 2 million illnesses and 23,000 deaths occur in the United States each year due to antibiotic-resistant infections. The main cause of increasing antibiotic resistance is the overuse and misuse of antibiotics. It is estimated that 30 percent of antibiotics prescribed are unnecessary. To avoid the treat of antibiotic-resistant infections, it is important to avoid taking unnecessary antibiotics. Antibiotics cannot treat **viral** infections, such as **cold**, flu, and most coughs. This article will explain what antibiotics are, how they work, any potential **side effects**, and antibiotic resistance.

**Keywords:** Antibiotics, Uses, Resistance, How do antibiotics work, Side effects, Allergy, How to use, Conclusion.

### Introduction

#### Antibiotics

**Antibiotics** are chemicals that kill or inhibit the growth of bacteria and are used to treat bacterial infections. They are produced in nature by soil bacteria and fungi. Antibiotics are chemicals that kill or inhibit the growth of bacteria and are used to treat bacterial infections. They are produced in nature by soil bacteria and fungi. This gives the microbe an advantage when competing for food and water and other limited resources in a particular habitat, as the antibiotic kills off their competition. Antibiotics take advantage of the difference between the structure of the bacterial cell and the host's cell.

They either prevent the bacterial cells from multiplying so that the bacterial population remains the same, allowing the host's defence mechanism to fight the infection or kill the bacteria, for example stopping the mechanism responsible for building their cell walls.

An antibiotic can also be classified according to the range of pathogens against which it is effective. Penicillin G will destroy only a few species of bacteria and is known as a narrow spectrum antibiotic. Tetracycline is effective against a wide range of organisms and is known as a broad spectrum antibiotic.

## Uses

Antibiotics are used to treat or prevent some types of bacterial infections. Antibiotics aren't effective against viral infections, such as the common cold or flu.

Antibiotics should only be prescribed to treat serious conditions:

that aren't especially serious but are unlikely to clear up without the use of antibiotics – such as moderately severe acne that aren't especially serious but could spread to other people if not promptly treated – such as the skin infection impetigo or the sexually transmitted diseases and infection Chlamydia where evidence suggests that antibiotics could significantly speed up recovery – such as a kidney infection that carry a risk of more serious complications – such as cellulitis or pneumonia. A doctor prescribes antibiotics for the treatment of a bacterial infection. It is not effective against viruses.

Know whether an infection is bacterial or viral helps to effectively treat it.

Viruses cause most upper respiratory tract infections (URTIs), such as the common cold and flu. Antibiotics do not work against these viruses. If people overuse antibiotics or use them incorrectly, the bacteria might become resistant. This means that the antibiotic becomes less effective against that type of bacterium, as the bacterium has been able to improve its defenses.

A doctor can prescribe a broad-spectrum antibiotic to treat a wide range of infections. A narrow-spectrum antibiotic is only effective against a few types of bacteria.

Some antibiotics attack aerobic bacteria, while others work against anaerobic bacteria. Aerobic bacteria need oxygen and anaerobic bacteria do not.

In some cases, a healthcare professional may provide antibiotics to prevent rather than treat an infection, as might be the case before surgery. This is the 'prophylactic' use of antibiotics.

People commonly use these antibiotics before bowel and orthopedic surgery. Antibiotics are sometimes given as a precaution to prevent, rather than treat, an infection. This is known as antibiotic prophylaxis.

Antibiotic prophylaxis is normally recommended if you're having surgery on a certain part of the body which carries a high risk of infection or where infection could lead to devastating effects.

For example, it may be used if you're going to have:

- some types of eye surgery – such as cataract surgery or glaucoma surgery
  - joint replacement surgery
  - breast implant surgery
  - pacemaker surgery
  - surgery to remove the gall bladder
- surgery to remove the appendix There are several medical conditions that make people particularly vulnerable to infection, making antibiotic prophylaxis necessary.

For example, the spleen plays an important role in filtering out harmful bacteria from the blood. People who have had their spleen removed, people having chemotherapy for cancer, or those with the blood disorder sickle cell anaemia, where their spleen doesn't work properly, should take antibiotics to prevent infection.

In some cases, antibiotic prophylaxis is prescribed for people who experience a recurring infection that's causing distress or an increased risk of complications, such as:

- cellulitis
- a urinary tract infection
- genital herpes
- rheumatic fever

**Resistance:** Antibiotic resistance is one of the biggest threats to global health, food security, and development today. Antibiotic resistance can affect anyone, of any age, in any country. Antibiotic resistance occurs naturally, but misuse of antibiotics in humans and animals is accelerating the process. Antibiotic resistance is

one of the biggest threats to global health, food security, and development today.

- Antibiotic resistance can affect anyone, of any age, in any country.
- Antibiotic resistance occurs naturally, but misuse of antibiotics in humans and animals is accelerating the process.
- A growing number of infections – such as pneumonia, tuberculosis, gonorrhoea, and salmonellosis – are becoming harder to treat as the antibiotics used to treat them become less effective.
- Antibiotic resistance leads to longer hospital stays, higher medical costs and increased mortality.
- Antibiotics are medicines used to prevent and treat bacterial infections. Antibiotic resistance occurs when bacteria change in response to the use of these medicines.
- Bacteria, not humans or animals, become antibiotic-resistant. These bacteria may infect humans and animals, and the infections they cause are harder to treat than those caused by non-resistant bacteria.
- Antibiotic resistance leads to higher medical costs, prolonged hospital stays, and increased mortality.
- The world urgently needs to change the way it prescribes and uses antibiotics. Even if new medicines are developed, without behaviour change, antibiotic resistance will remain a major threat. Behaviour changes must also include actions to reduce the spread of infections through vaccination, hand washing, practising safer sex, and good food hygiene.
- Antibiotic resistance is rising to dangerously high levels in all parts of the world. New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases. A growing list of infections – such as pneumonia, tuberculosis, blood poisoning, gonorrhoea, and foodborne diseases – are becoming harder, and sometimes impossible, to treat as antibiotics become less effective.
- Where antibiotics can be bought for human or animal use without a prescription, the emergence and spread of resistance is made worse. Similarly, in countries without standard treatment guidelines, antibiotics are often over-

prescribed by health workers and veterinarians and over-used by the public.

### Health professionals

To prevent and control the spread of antibiotic resistance, health professionals can:

- Prevent infections by ensuring your hands, instruments, and environment are clean.
- Only prescribe and dispense antibiotics when they are needed, according to current guidelines.
- Report antibiotic-resistant infections to surveillance teams.
- Talk to your patients about how to take antibiotics correctly, antibiotic resistance and the dangers of misuse.
- Talk to your patients about preventing infections (for example, vaccination, hand washing, safer sex, and covering nose and mouth when sneezing).

### Healthcare industry

To prevent and control the spread of antibiotic resistance, the health industry can:

- Invest in research and development of new antibiotics, vaccines, diagnostics and other tools.

### Agriculture sector

To prevent and control the spread of antibiotic resistance, the agriculture sector can:

- Only give antibiotics to animals under veterinary supervision.
- Not use antibiotics for growth promotion or to prevent diseases in healthy animals.
- Vaccinate animals to reduce the need for antibiotics and use alternatives to antibiotics when available.
- Promote and apply good practices at all steps of production and processing of foods from animal and plant sources.
- Improve biosecurity on farms and prevent infections through improved hygiene and animal welfare.

## Side effects

Antibiotics commonly cause the following side effects:

- diarrhea
- nausea
- vomiting
- rash
- upset stomach
- with certain antibiotics or prolonged use, fungal infections of the mouth, digestive tract, and vagina

Less common side effects of antibiotics include:

- formation of kidney stones, when taking sulphonamides
- abnormal blood clotting, when taking some cephalosporins)
- sensitivity to sunlight, when taking tetracyclines
- blood disorders, when taking trimethoprim
- deafness, when taking erythromycin and the aminoglycosides

Some people, especially older adults, may experience bowel inflammation, which can lead to severe, bloody diarrhea.

In less common instances, penicillins, cephalosporins, and erythromycin can also cause inflamed bowels.

## Allergy

Some people may develop an allergic reaction to antibiotics, especially penicillins. Side effects might include a rash, swelling of the tongue and face, and difficulty breathing.

Allergic reactions to antibiotics might be immediate or delayed hypersensitivity reactions.

**Anyone who has an allergic reaction to an antibiotic must tell their doctor or pharmacist.** Reactions to antibiotics can be serious and sometimes fatal. They are called anaphylactic reactions.

People with reduced liver or kidney function should be cautious when using antibiotics.

This may affect the types of antibiotics they can use or the dose they receive.

Likewise, women who are pregnant or breast-feeding should speak with a doctor about the best antibiotics to take.

## Interactions

Individuals taking an antibiotic should not take other medicines or herbal remedies without speaking with a doctor first. Certain OTC medicines might also interact with antibiotics.

Some doctors suggest that antibiotics can reduce the effectiveness of oral contraceptives. However, research does not generally support this.

Nonetheless, people who experience diarrhea and vomiting or are not taking their oral contraceptive during illness because of an upset stomach might find that its effectiveness reduces.

In these circumstances, take additional contraceptive precautions.

People usually take antibiotics by mouth. However, doctors can administer them by injection or apply them directly to the part of the body with infection.

Most antibiotics start combating infection within a few hours. Complete the whole course of medication to prevent the return of the infection.

Stopping the medication before the course has finished increases the risk that the bacteria will become resistant to future treatments. The ones that survive will have had some exposure to the antibiotic and may consequently develop resistance to it.

**An individual needs to complete the course of antibiotic treatment even after they see an improvement in symptoms.**

Do not take some antibiotics with certain foods and drinks. Take others on an empty stomach, about an hour before meals, or 2 hours after. Follow the instructions correctly for the

medication to be effective. People taking metronidazole should not drink alcohol.

Avoid dairy products when taking tetracyclines, as these might disrupt the absorption of the medication.

### Recent developments

While there are some new antibiotics in development, none of them are expected to be effective against the most dangerous forms of antibiotic-resistant bacteria.

Given the ease and frequency with which people now travel, antibiotic resistance is a global problem, requiring efforts from all nations and many sectors.

### Impact

When infections can no longer be treated by first-line antibiotics, more expensive medicines must be used. A longer duration of illness and treatment, often in hospitals, increases health care costs as well as the economic burden on families and societies.

Antibiotic resistance is putting the achievements of modern medicine at risk. Organ transplantations, chemotherapy and surgeries such as caesarean sections become much more dangerous without effective antibiotics for the prevention and treatment of infections.

### WHO response

Tackling antibiotic resistance is a high priority for WHO. A global action plan on antimicrobial resistance, including antibiotic resistance, was endorsed at the World Health Assembly in May 2015. The global action plan aims to ensure prevention and treatment of infectious diseases with safe and effective medicines.

The “Global action plan on antimicrobial resistance” has 5 strategic objectives:

- To improve awareness and understanding of antimicrobial resistance.
- To strengthen surveillance and research.

- To reduce the incidence of infection.
- To optimize the use of antimicrobial medicines.
- To ensure sustainable investment in countering antimicrobial resistance.

A political declaration endorsed by Heads of State at the United Nations General Assembly in New York in September 2016 signaled the world’s commitment to taking a broad, coordinated approach to address the root causes of antimicrobial resistance across multiple sectors, especially human health, animal health and agriculture. WHO is supporting Member States to develop national action plans on antimicrobial resistance, based on the global action plan.

WHO has been leading multiple initiatives to address antimicrobial resistance:

### World Antibiotic Awareness Week

Held every November since 2015 with the theme “Antibiotics: Handle with care”, the global, multi-year campaign has increasing volume of activities during the week of the campaign.

### The Global Antimicrobial Resistance Surveillance System (GLASS)

The WHO-supported system supports a standardized approach to the collection, analysis and sharing of data related to antimicrobial resistance at a global level to inform decision-making, drive local, national and regional action.

### Global Antibiotic Research and Development Partnership (GARDP)

A joint initiative of WHO and Drugs for Neglected Diseases initiative (DNDi), GARDP encourages research and development through public-private partnerships. By 2023, the partnership aims to develop and deliver up to four new treatments, through improvement of existing antibiotics and acceleration of the entry of new antibiotic drugs.

## Interagency Coordination Group on Antimicrobial Resistance (IACG)

The United Nations Secretary-General has established IACG to improve coordination between international organizations and to ensure effective global action against this threat to health security. The IACG is co-chaired by the UN Deputy Secretary-General and the Director General of WHO and comprises high level representatives of relevant UN agencies, other international organizations, and individual experts across different sectors.

### Conclusion

A small-scale preliminary trial concludes that bacteriophages — viruses that infect bacteria — might be a viable replacement for antibiotics in the future. Although antibiotics have saved countless lives throughout their long history in medicine, they are not without problems.

Antibiotic resistance is a major concern. In fact, the World Health Organization (WHO) deem it "one of the biggest threats to global health, food security, and development today."

Besides the looming terror of resistance, the use of antibiotics brings other concerns.

For instance, although they destroy the bacteria that are causing disease, they also indiscriminately kill other species of bacteria.

It is becoming ever clearer that our gut bacteria are an essential part of our health, and destroying them in huge numbers will have negative consequences.

Antibiotics can also cause gastrointestinal distress — often because of the mass culling of bacteria.

For these reasons, the hunt for alternatives to antibiotics is hotting up. Scientists in the Department of Nutrition and Food Studies at George Mason University in Fairfax, VA, are interested in the therapeutic potential of bacteriophages.

Their latest results were presented at the American Society for Nutrition's annual meeting, Nutrition 2018, held in Boston, MA.

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