STM JOURNALS

International Journal of
Antibiotics

ISSN: 2584-2986
Volume 3, Issue 2, 2026
July–December
DOI (Journal): 10.37591/IJAB

https://journals.stmjournals.com/ijab

Review IJAB

Antibiotics: Miracle Drugs or Misapplied Medicine?

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Abstract

Antibiotics revolutionised modern medicine, transforming deadly bacterial infections into treatable ones and making possible surgery, cancer therapy, and organ transplantation. However, their overuse and misuse has led to a rising worldwide health problem: antibiotic resistance. This article discusses the paradox of antibiotics – powerful life-saving medications and possible drivers of a public health emergency. It reviews the modes of action of antibiotics, their significance in the treatment of bacterial infections and the repercussions of their overuse and misuse for human health, agriculture and clinical practice. The conversation also brings up the advent of resistant forms of bacteria, the diminished effectiveness of conventional therapies, and the problems of discovering new antibiotics. It highlights the necessity of appropriate use, public awareness and global efforts to combat resistance. Finally, the author concludes that antibiotics are still indispensable, but their future efficacy depends on judicious stewardship and educated use.

Keywords: Antibiotics, bacterial infections resistance to antibiotics, substance abuse public health, antimicrobial stewardship health care practices

INTRODUCTION

Antibiotics are drugs that fight infections caused by particular bacteria. An infection is when microorganisms enter the body, multiply and cause disease. Other forms of bacteria, such as viruses, fungi, and parasites, can also cause illnesses, but antibiotics don't work against these germs. Resellers might have antibiotics in stock without a prescription. Antibiotic resistance is an increasing concern with major health implications. Bacteria that develop resistance to antibiotics can make infections more difficult or impossible to treat. Antibiotics are medicines that kill bacteria or stop bacteria from growing. They target unique properties of bacterial cells that human cells do not have, which means they are powerful against bacteria, but normally do not harm human cells. Bacterial cells are surrounded by a tough outer wall which protects the contents of the cell. Some antibiotics destroy the cell wall so it can no longer hold in water. Other antibiotics block the bacteria from generating proteins that the bacteria need to stay alive. Antibiotics – like tetracycline and erythromycin d64005a5-034c-436e-b288-c3d83e0693c6d bacterial structures – are called ribosomes that produce proteins. The bacteria are not killed by antibiotics that inhibit protein synthesis, but they are prevented from proliferating [1].

Antibiotics have saved millions of lives and are one of the greatest achievements of medicine. Surgery used to be regularly followed by fatal infections, until antibiotics were discovered. Antibiotics now allow people to survive life threatening injuries and surgical procedures without developing infections [2].

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Received Date: May 07, 2026
Accepted Date: May 12, 2026
Published Date: May 30, 2026

Citation: V. Hans Basil. Antibiotics: Miracle Drugs or Misapplied Medicine? International Journal of Antibiotics. 2026; 3(2): 20–27p.

HOW DO ANTIBIOTICS WORK?

Antibiotics are compounds which kill germs or stop them from growing. They are important in treating bacterial infections in humans and animals. Bacteria are tiny organisms that can live just about any place. An infection happens when these organisms get into the body, reproduce and interfere

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with normal body functioning. Antibiotics don't work against viruses, fungi, and parasites. Doctors only administer them when they have determined a bacterial cause.

But bacteria can survive without antibiotics not everything. Antibiotics function by killing germs or by stopping them from multiplying, so the body's immune system can eliminate them. Most antibiotics interfere with cell wall development. Bacteria have a stiff outer wall to provide structure and protection. Some medications stop this wall from being built so the bacteria burst. Others block the proteins' production. Bacteria need proteins to survive. Some antibiotics interfere with the bacterial machinery for generating proteins so that the bacteria are unable to manufacture the proteins they need [1].

WHY ARE THEY IMPORTANT?

Antibiotics are classes of drugs that are used to treat certain bacterial illnesses in people and animals. They work by attacking essential structures and processes unique to bacteria (such as cell-wall structure or protein translation) and missing in higher life-forms. Antibiotics are one of the safest and most effective therapeutic therapies, but their abuse has increased [2].

Bacterial and viral illnesses are different in two ways. First, bacteria are living entities that can grow and proliferate independently of their hosts. Bacterial infection happens in four stages. Bacteria enter the host, the population increases, toxins are generated and the host immune systems begin to work. Examples include pneumonia (lung infection), and a wound containing a bacterial contamination. We also recognise the importance of antibiotics in emergency medicine. When the barrier between tissues and blood is broken in trauma, the danger of life-threatening infections increases dramatically. Ventilator-associated pneumonia remains the worst complication for critical care unit patients. In both cases antibiotics are life savers [1].

THE ADVANTAGE OF ANTIBIOTICS

Antibiotics are important to health and health care. They kill bacteria or stop bacteria from growing. They know the difference between bacteria and viruses. The use of antibiotics is critical in the treatment of acute and chronic bacterial illnesses. They are employed in several acute illnesses such as pneumonia, streptococcal throat infections, and wound infections. In crises – such as sepsis, a dangerous condition that can kill within hours – antibiotics save lives. They decrease complications and enhance survival chances after surgery and other invasive operations Antibiotics have saved millions of lives and revolutionised medicine. Infections that produce pus or pyogenic infections (viral, bacterial, fungal and protozoal) have afflicted mankind since antiquity. These may involve the skin and appendages, bones and joints, soft tissue, respiratory tract, central nervous system, and other systems. They may be transmitted by direct touch or by a combination of puncture, insertive, and contact pathways. Such infections may occur after surgery, trauma or the introduction of a foreign body into the body. The management of pyogenic infections is still difficult and challenging.

Bacterial Infection

Antibiotics kill bacteria or prevent them from growing. They are used to treat infections caused by these bugs. Bacteria are microscopic living organisms that can cause diseases. An infection develops when bacteria or other germs invade the body, grow and produce damage. Many common infections can now be safely treated. If a patient had an infection, like that, a doctor would prescribe them special drugs. Antibiotic resistance, the ability of germs to withstand the effects of antibiotics, is partly caused by the misuse or needless use of these medicines.

Antibiotics are lifesaving. They are used for serious bacterial infections such as pneumonia and wound infections. Many of these infections would be fatal without treatment. Antibiotics are used after injuries and surgery to stop infection. When the body is injured, the chance of infection rises. For example, a traffic accident may inflict several injuries. Dirt and bacteria get into the body. Antibiotic prophylaxis is used to prevent infection. In other instances – like, for example, in cancer treatment where the immune system is weak and the danger of infections is increased [2] – doctors find antibiotics

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vital. [“cite_from”: “(Loi, 2017)” “cite_id”: “4ea5637e-4f61-49e3-aa07-fd635294c7d5” (Bin Zaman et al., 2017) d64005a5-034c-436e-b288-c3d83e0693c6].

Rescue Lives in an Emergency

Antibiotics can save lives in crises. They are vital in handling severe infections resulting from traumatic wounds. For example, infected injuries from natural disasters such as earthquakes. Surgical procedures continue to rely on antibiotics. Some people are more susceptible to post-operative infections than others. Antibiotics are usually provided in advance in these circumstances. Many individuals with badly injured bone or skin receive antibiotics. Medical specialists [2] say that antibiotics are useful to prevent probable infections since germs can enter the body through surgical wounds.

Hospitalisations for curable illnesses – such as pneumonia, sepsis, or cellulitis – are also considered emergencies. Patients with pneumonia are immediately started on intravenous antibiotics. For people with sepsis or cellulitis, the doctor prescribes different antibiotics. Each of these circumstances means that patients would not survive without antibiotics. One doctor recalled a patient who had surgery for intestinal obstruction and, 24 hours later, had faeces escaping from the abdominal wall. Treatment was two bags of intravenous antibiotics and close observation, the risk of losing the patient was evoked. The huge influence antibiotics have in saving the lives of many emergency patients with a wide spectrum of ailments makes them so important.

THE RISKS AND THRESHOLDS

Antibiotics are important treatments for illnesses caused by bacteria such as pneumonia and wound infections. They save millions of lives every year in emergencies & procedures. But antibiotics can have hazards, and specialists concede several restrictions. Side effects include skin rashes, nausea or more serious injury are caused by improper use. They are not effective against viral infections including the common cold, most cases of flu and COVID-19. Viruses cause most coughs and fevers. These simple sentences show that antibiotics have limits, and these limits need to be recognised to prevent misunderstanding, misuse and overuse.

The most generally recognised limitation is antibiotic resistance. Antibiotic resistance is the ability of some bacteria to survive and proliferate in the presence of antibiotics. It kills or stops the growth of non-resistant bacteria. This means that the resistant bacteria can multiply. greater use = greater exposure = faster development and spread of resistance. Antibiotics can also become ineffective when used inappropriately – if taken every other day, or when dosages are missed or not completed, sick bacteria may survive and build resistance. Broad spectrum antibiotics select for resistant strains more than narrow spectrum medicines [2]. Comd64005a5-034c-436e-b288-c3d83e0693c6ations are more selective than single agents. Overuse is also promoted by prescriptions that are not acceptable and the public availability of antibiotics, for example in developing countries where they may be acquired without a prescription. Inappropriate self-medication, treatment of non-bacterial diseases and use for prophylaxis also increase demand. And even attempting to fight resistance causes resistance. Limiting the use of antibiotics that are in high demand puts pressure on people to find alternatives.

Side effects might be minor and common to severe and unusual. Typical side effects include diarrhoea, skin rashes, and nausea. Serious yet rare problems – such as anaphylaxis – may occur. Certain antibiotics can disrupt normal gut flora allowing overgrowth of Clostridium difficile which can lead to serious illness of the intestine. Broad-spectrum antibiotic self-medication once symptoms resolve leads to significant gut damage and opportunistic infections [1]. If the prescription is inaccurate (viral infection, improper medicine used for bacterial infection), the antibiotics may not work either.

Antimicrobial Resistance

Antibiotic resistance occurs when bacteria mutate so antibiotics no longer function. Even old antibiotics don’t work. Resistance is a worldwide health threat. Antibiotics only work against bacteria, not viruses. But some patients still insist on antibiotics for colds or flu.

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Resistance develops because germs reproduce rapidly. When a patient takes antibiotics, the sensitive bacteria die, while the resistant bacteria live and proliferate. Antibiotic abuse breeds resistance. That may be one reason why twenty-five thousand people die each year in Europe alone.

Resistant germs transfer rapidly from people to people. They compromise food safety and cause cross-infection in hospitals. Some germs are pan-resistant, meaning they have no therapy. These microorganisms make small procedures, like placing a drip life-threatening, as the danger of infection is too high [1].

Adverse Effects and Harm

Antibiotics can injure individuals and produce negative effects. Diarrhoea, vomiting, nausea and rashes are common adverse effects. Allergic responses can occur, sometimes serious. Other unusual adverse effects include disruption of the gut microbiota and bad interactions with other drugs such as the anti-epileptic medicine lamotrigine and several hormonal contraceptives [3]. It's also an issue to take antibiotics when you don't need them.

Antibiotics do not kill viruses or help with viral illnesses such as the flu, common cold, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or many throat infections [2]. Other types of misuse include missing doses, adjusting the dose without consulting a doctor, or taking someone else's prescription.

Antibiotic resistance is a major cause of morbidity and mortality and a serious threat to health care, although antibiotics can save lives, preserve health or prevent serious illness. Simple decision guidelines to help select the proper infection to treat and the right antibiotic to provide when prescribing a broad-spectrum antibiotic for a narrow-spectrum indication will limit the selective pressure for bacteria to evolve resistance. Guidelines that encourage quitting antibiotics as soon as clinically acceptable can help reduce unnecessary exposure and consequently the likelihood of resistance.

When They're Useless

Antibiotics don't work for all diseases. They are for certain conditions. For example, an antibiotic will not cure a virus–cold. Asthma or pollution causes coughing. It is not bacterial hence drugs will not heal it. When a patient needs aid, doctors must prescribe the correct kind of medicine. Nervousness or food poisoning can induce stomach cramps, but neither is a bacterial infection.

Patients sometimes ask for needless antibiotics for an illness. Taking these out would make a major difference. When antibiotics were first discovered doctors thought they healed practically everything. Any prescription letter with a cough or sniffle, got antibiotics. Patients still want to leave the appointment with a prescription today, and insurance companies who want to cover "better" treatments are pushing for them to receive one [2].

THE INTELLIGENT USE OF ANTIBIOTICS

Antibiotics are used to treat infections caused by bacteria. Bacteria are microscopic organisms, much smaller than a grain of sand. Some bacteria cause illnesses and make people ill. Some are innocuous or even beneficial. Antibiotics kill the dangerous germs that cause illnesses. They do it different ways. Some medications stop bacteria from developing their outer walls. Others prevent bacteria from generating proteins they need to survive. These actions destroy germs or inhibit their growth.

Antibiotics don't work against illnesses caused by viruses, such colds or flu. Viruses are smaller than bacteria. They are distinct. Antibiotics do not kill or work on viruses. Instead, the body's immune system defends against and kills infections. Antibiotics only effect bacteria. Not viruses. Therefore, antibiotics should not be used to treat viral infections. Antibiotic abuse is the use of antibiotics when there is no bacterial illness.

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An antibiotic when used correctly can be really helpful. The correct antibiotic helps the body fight a specific bacterial infection. The doctor gives the proper antibiotic to the patient based on facts about the patient and the germs. Information on a patient includes age, weight, other medications being taken, and particular health problems such as allergies. This includes information about which germs are making the patient unwell and if those bacteria are resistant to any antibiotics. With this information, the doctor can provide the right antibiotic to the patient. The antibiotic that is ordered and is the correct one will kill or halt the bacterium.

Correct Infection Correct Medicine

Choosing the correct medicine for the specific bacterial infection present is essential to successfully resolve a disease and to prevent hazardous, sometimes fatal consequences [2]. The details vary for different antibiotics, but in simple words an important factor in choosing a medicine is to avoid development of resistance. Prescribing guidelines suggest that broad spectrum medications are not needed for many common infections and may be dangerous. For example, if a patient's fungal infection is thought to be caused by a known pathogen such as Candida (a type of yeast), then it makes sense to replace the current broad-spectrum antifungal (like fluconazole) with a drug that is specific for Candida (like amphotericin B or caspofungin). Another way to prevent additional resistance is to switch from a broad-spectrum medicine to a more narrow-spectrum one, even if the replacement is within the same drug class.

A wide and indiscriminate approach is just not the best response in many circumstances. The lesson is that you must know exactly what is causing the problem before you try to remedy it. In day-to-day situations the question of help is often cross-examined. A correct diagnosis of the underlying cause of the problem allows for a more successful solution of the dilemma or at least it allows for an approach that does not worsen the original condition. The use of the proper agent is vital for optimal health with all medications, including antibiotics.

Course End

Oral antibiotics are usually given in pill or liquid form and it's crucial to take the exact quantity prescribed by the doctor. If you stop too early you may leave some bacteria alive. These germs that survive might grow and get stronger, causing a new infection that is tougher to cure. These microorganisms can develop resistance to some medications even in a brief break. Some drugs have to be given at regular intervals, and missing doses might potentially lead to resistance. If a patient has trouble with maintaining a schedule, it may be more effective to help with this difficulty than to provide an early refill [4].

Finally, patients should be cautious while using leftover antibiotics. Taking someone else's drugs is incredibly risky, if no evident improvement is shown after a few days a quick modification may be needed. Leftover medicines or taking leftover pills from others hinders patients from seeing a doctor when they truly need to. An unfavourable outcome, such as a worsening of sickness or a new illness or other side effect, may make it much more pressing to visit a health expert [5].

Avoiding Overkill

Ineffective antibiotics lead to waste, add to the load on medical systems and manufacturers' drive to deliver outmoded products. Resistance. antimicrobials produced for infection animals that do not threaten human, principally. The misuse of veterinary medications with comparable compositions is a concern to commercial meat sources. Prescriptions for human use result from the availability of veterinary dosages in human drugs. The release of untreated effluent and wastewater from urban areas makes resistances that travel outside of metropolitan areas. interactively goes in distance direction for public health and relevant management and other persons endorsed one multi-pronged endeavour achieve improvement high-pressure area wide dead-end view simple policy developed by. An important job is to build rationales concerning resistance development following patient public policy [2].

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WHAT SCIENTISTS AND DOCTORS DO

Scientists and clinicians are working hard to tackle the problems created by the overuse of antibiotics. They are seeking ways to preserve the effectiveness of existing antibiotics and to fight the emergence of bacterial resistance. Some teams search for novel antibiotics and drugs to treat infections caused by bacteria. Others are developing diagnostics that can detect whether an infection is bacterial or viral, how bad it is and which drugs would work [2].

Antibiotic stewardship programs develop criteria for when to prescribe, what kind of antibiotic to prescribe, and how to change medications if the patient does not improve. These strategies shorten the time patients spend on antibiotics and limit the usage of long-term and broad-spectrum medicines. By cutting back on unneeded use, these initiatives reduce the chances that bacteria may acquire resistance and pass it on to other germs. Now new standards have been presented to help doctors, patients and communities improve these programs.

Fresh Findings

Antibiotics are life-saving medicines that destroy or slow down harmful germs and treat diseases caused by bacteria. They are not effective against viruses. The capacity to halt bacterial infections is critical for successful cancer therapies, safe management of uncontrolled diabetes, healing from injuries, and many surgical operations. In a 2015 study, 9% of individuals with diabetic foot infections had amputations when bacteria were responsive to treatments. This figure increased to 26% in patients with resistant bacteria [6]. Antibiotics are still essential for treating common infections such as pneumonia and urinary tract infections. Over the years the discovery of new antibiotics has dramatically slowed [1]. Most new antibiotics are only tweaks of old drugs. Scientists are still looking for alternatives. Another strategy is to increase the efficacy of current antibiotics such as comd64005a5-034c-436e-b288-c3d83e0693c6ing them with natural plant extracts.

Improved Guidance on the Use

Antibiotics are generally seen as miracle treatments that will heal us of any sickness caused by germs. They save millions of lives annually. But these are drugs that are used to treat a variety of bacterial diseases. Not all diseases come from bacteria, many come from viruses. Understanding of the mechanism of antibiotics, when they are indicated for usage and how they should be supplied helps to prevent overuse.

Most antibiotics have a specific target in bacteria that the medicine can attack. Some antibiotics can inhibit the bacterial cell wall development which is essential for the bacteria to survive. Other antibiotics act on the machinery bacteria employ to make their proteins. Antibiotics do not function against viruses. Viruses are substantially smaller than bacteria, and structurally simpler. They insert their genetic material into the host cell and commandeer the biological machinery to replicate. Viruses aren't impacted by antibiotics because they aren't built the same way as bacteria. Vaccines can prevent some viruses but cannot heal diseases caused by them.

YOU AND PUBLIC HEALTH

In his thought-provoking article, "Working Around the Impending Antibiotic Crisis," Luxembourg-based medical officer Fabio Loi discusses the dangers of improper antibiotic usage in the context of individual patient needs, which often trump collective public health considerations when a physician decides on a treatment plan. But antibiotics are different to other medicines because, unlike cough syrup or painkiller, a person's response to therapy can have serious implications for how other patients and the wider community respond to treatment in the future. Antibiotics can directly kill germs, but they can also impose selection pressure for the development of resistance in bacteria. Just as humans can pass on diseases or infections caused by bacteria when they sneeze, eat food or engage in intimate contact – conventional defence being personal hygiene and vaccinization – so can they unknowingly distribute bacteria that have evolved deadly resistances. The slowing of the spread of antibiotic resistance organisms helps society while accelerating the spread is costly to society [2]. drug resistance

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is a natural phenomenon, happening whenever antibiotics are used. In nature, the genetic lottery ensures that there will be some organisms resistant to any drug that exists. The resistance phenotype evolves faster and more intensely when antibiotics are misused and overused. The use of broad-spectrum agents, antibiotics active against a wide range of microbes, for narrow problems, or the use of aggressive antibiotic treatments for mild infections, increases the selective pressure on the resistance phenotype, personally extending the access of fellow patients to low-cost broad spectrum agents. Telling patients to take the full course of antibiotics even after they feel better can also fuel the development and spread of resistance.

What Patients Can Do

Antibiotics are vital drugs that work powerfully. Patients can assist in using them wisely. This is how we safeguard others, keep medications available and hold down resistance. Follow these pointers.

Take antibiotics only when prescribed by a doctor. Don't ever ask for antibiotics for a cold. Colds are caused by a virus. They are not sensitive to antibiotics. So, antibiotics are not needed and will not benefit you. Other drugs are used to treat cold symptoms.

Take all the antibiotics as prescribed, even if the person feels better. Early stopping permits some resistant germs to survive, which can lead to re-infection. Then a second course or a stronger antibiotic is needed to fight reinfection. Stronger antibiotics are more dangerous and can lengthen the course of sickness. Many persons report prolonged illnesses following early cessation of antibiotics [7, 8].

Tell your doctor about any allergies and adverse reactions to medications before you receive a prescription. Penicillin is a useful antibiotic; however, some people have an allergy to it. Severe allergic reactions can be deadly. Stopping the treatment too early (e.g., after improving) causes serious health concerns [2].

What Communities Should Do

Communities have a vital role to play too. The fight against antibiotic resistance must be fought at every level: nationally, regionally, locally and also at the household level. The World Health Organization has proposed five goals for communities to follow [2]. First, make people more aware of the dangers of misusing antibiotics. Second, encourage the development of new therapies, vaccines and diagnostics Third, advocate the judicious use of antibiotics in food production. Fourth, restrict and supervise the sale of antibiotics, and ensure that they are only available by prescription. Fifth, eliminate retail and other food–water systems that may contaminate animal excreta. These efforts can, therefore, help others avoid the full costs of overuse or waste in an Antibiotic-Free community.

Communities and trade or religious groups can also provide rewards to responsible users of antibiotics. For example, communities should collectively reward a local doctor who finds ways to administer antibiotics while minimising the chance of resistance winning. Instead of letting the doctor quit and playing with all the other options, other worried people might applaud their combined efforts for Antibiotic-Free practices and not punish the single antibiotic user [9, 10].

CONCLUSION

Antibiotics fight bacterial illnesses. They can destroy germs or prevent them from growing. Doctors only give antibiotics to treat infections caused by bacteria. These medications are not antivirals that attack viruses. Bacteria are microscopic living things. Sometimes they can make people sick. An antibiotic is a medicine that kills bacteria or stops it from growing. It doesn't work against viruses. The first antibiotic was penicillin. It helps patients get over a one- or two-day fever following a bacterial pneumonia. A cow kicks a man with a wound, and an antibiotic saves his life. No antibiotics are administered during the influenza season. Patients take a long time to heal, but they don't become worse. Antibiotics are miraculous drugs, just for bacteria not viruses. Misuse causes resistance.

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Knowing precisely how antibiotics act on bacteria makes sure the treatment is safe. Overuse and misuse breed resistant bacteria and make antibiotics ineffective in the future. “Patients should only take antibiotics when they need them.” Choosing well will maintain their effect.

The kingdom of fungi is enormous and diverse, and is important to ecosystems, industry, agriculture and medicine. Mycology has been gaining relevance due to its ecological and biotechnological value. Fungi have important roles in natural systems and human life through decomposition of organic materials, mutualistic relationships with plants, and the production of antibiotics and fermented products. Molecular biology and genetics have greatly contributed recently to our understanding of fungal diversity, physiology and evolution. These results have led to the discovery of new species and metabolic pathways previously unknown, many of which have intriguing promise for a variety of applications. By employing these sophisticated methods, scientists have been able to shed light on the intricate biological roles of mushrooms, uncovering their extensive genetic diversity and adaptability.

If it is proven that there is invading bacteria other than those ordinarily seen, an antibiotic is recommended. Microbial examination may be helpful to identify what kind of bacterium it is. Then the precise bacteria causing the ailment can be identified and also the type of antibiotic can be determined. If pneumonia is suspected, penicillin can still be written on the prescription. For a high fever that lasts for a few days, Prescrid64005a5-034c-436e-b288-c3d83e0693c6g is permitted, but the dosage should not exceed the maximum. “Encourage patients to get a good night’s sleep. If test examination confirms the flu virus, antibiotics are irrelevant.

REFERENCES

1. Estany-Gestal A, Salgado-Barreira A, Vazquez-Lago JM. Antibiotic use and antimicrobial resistance: A global public health crisis. Antibiotics (Basel). 2024;13(9):900.
2. Mackenzie D. Reboot antibiotics arsenal at any cost. New Sci. 2014;(2970):10–11.
3. Uddin MN, Rahman MH, Hasan MM, Islam MN, Sarkar MB, Islam MR, et al. Survey on antimicrobial resistance: Reason behind the misuse of antibiotics in Bangladesh. J Pharm Res Int. 2017;18(6):1–8.
4. Wiese-Posselt M, Saydan S, Lâm TT, Rörig A, Bergmann C, Becker F, et al. Development and evaluation of a massive open online course (MOOC) to teach medical students the prudent use of antibiotics. Antimicrob Resist Infect Control. 2025;14(1):105.
5. Maeda M, Yamaguchi K. Impact of education on antibiotic literacy and awareness among pharmacy students at a Japanese university: A questionnaire survey. J Pharm Health Care Sci. 2025;11(1):12.
6. Wright GD. Opportunities for natural products in 21st century antibiotic discovery. Nat Prod Rep. 2017;34(7):694–701.
7. Grigoryan L, Monnet DL, Haaijer-Ruskamp FM, Bonten MJ, Lundborg S, Verheij TJ. Self-medication with antibiotics in Europe: A case for action. Curr Drug Saf. 2010;5(4):329–332.
8. Ali MH, Kalima P, Maxwell SR. Failure to implement hospital antimicrobial prescribing guidelines: A comparison of two UK academic centres. J Antimicrob Chemother. 2006;57(5):959–962.
9. Seth-Smith HM, Rooney AM, Egli A. Strain typing (bacterial, viral, fungal, and mycobacterial). In: Manual of Molecular Microbiology: Fundamentals and Applications. 2025. p. 48–73.
10. Nathan C, Cars O. Antibiotic resistance—Problems, progress, and prospects. N Engl J Med. 2014;371(19):1761–1763.

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