

# Antimicrobial Resistance

## FREQUENTLY ASKED QUESTIONS

**Q . What is antimicrobial resistance?**

**A .** Microbes (bacteria, fungi, parasites and viruses) cause infectious diseases, and antimicrobial agents (such as penicillin, streptomycin, and over 150 others) have been developed to combat the severity and spread of many of these diseases. The emergence of resistance to such drugs is a natural biological phenomenon. The use of an antimicrobial for any infection, in any dose and over any time period, causes a “selective pressure” on microbial populations. Under optimal conditions, the majority of the infecting microbes will be killed and the body’s immune system can deal with the rest. However, if a few resistant mutants exist in the population under selective pressure and the treatment is insufficient or the patient is immunocompromised, the mutants can flourish. Thus treatment may fail.

**Q . Why is antimicrobial resistance a problem?**

**A .** Infections caused by resistant microbes often fail to respond to treatment, resulting in prolonged illness and greater risk of death. When treatment fails or response to treatment is slow, the patient remains infective for a longer time. This provides greater opportunities for the resistant strain to spread to other people.

**Q . How serious is the problem?**

**A .** The discovery of antimicrobials in the previous century was followed by spectacular gains in human health and life expectancy. The emergence of resistance to these “wonder drugs” is now so widespread that it threatens to undermine – or even reverse – these gains.

**Q . Is the problem worse than in the past?**

**A .** Yes. In the past, medicine and science were able to stay ahead of the natural phenomenon of resistance through the discovery of potent new antimicrobials. This discovery process flourished from 1930–1970, particularly for antibacterial drugs, but has since slowed, partly because of misplaced confidence that infectious diseases had been conquered, at least in the industrialized world.

**Q . Is there special cause for alarm?**

**A .** Yes. Today, when a resistant strain emerges, there is not necessarily a new “wonder drug” ready on the shelf. Most alarming of all are microbes that have “accumulated” resistance genes to virtually all currently available drugs and have the potential to cause untreatable infections, thus raising the spectre of a post-antibiotic era. Even if the pharmaceutical industry were to step up efforts to develop new drugs immediately, current trends suggest that some diseases will have no effective therapies within the next ten years.

**Q . Why has this happened now?**

**A .** In just the past few decades, the development and spread of resistant microbes has been greatly accelerated by several concurrent trends. These have worked to increase both the number of infections and the spread of infections from person to person, thus creating an increased need for antimicrobials.

**Q . What are some of these trends?**

**A .** Important trends include urbanization with its associated overcrowding and poor sanitation; pollution, environmental degradation and changing weather patterns, which can affect

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the incidence and distribution of infectious diseases; and a growing proportion of elderly people needing hospital-based treatments and thus at risk of exposure to highly resistant pathogens found in hospitals.

Additional trends include the AIDS epidemic, which has greatly enlarged the population of immunocompromised patients at risk of opportunistic infections, and the resurgence of old foes such as malaria and tuberculosis, causing millions of infections each year. The enormous growth of global trade and travel means that a resistant microbe can spread from its place of origin to almost anywhere else in the world within 24 hours.

**Q . What is the most important cause of resistance?**

**A .** Although the natural phenomenon by which resistance emerges can be accelerated and amplified by a variety of factors, the most important cause is the inappropriate use of antimicrobials.

**Q . What constitutes “inappropriate” use of antimicrobials?**

**A .** Inappropriate use occurs when antimicrobials are taken for too short a time, at too low a dose, at inadequate potency, or for the wrong disease. Both overuse, such as through the over-prescribing of antimicrobials, which tends to occur in wealthier nations, and underuse through lack of access, inadequate dosing, poor adherence, and poor quality drugs, play a role. For example, in some developing countries, antimicrobials can be purchased in single doses without a prescription. Economic hardship means that many patients will stop taking an antimicrobial as soon as they feel better, which may occur before the microbe has been eliminated.

**Q . Are other economic factors involved?**

**A .** Yes. When infections become resistant to first-choice, or “first-line” drugs, treatment has to be switched to second- or third-line drugs, which are often more expensive and may not

be available in some settings. For example, the drugs needed to treat multidrug-resistant forms of tuberculosis are over 100 times more expensive than the first-line drugs used to treat non-resistant forms.

In many countries, the high cost of such replacement drugs is prohibitive, with the result that some diseases can no longer be treated in areas where resistance to first-line drugs is widespread. In addition to the cost of drugs, patients infected with resistant microbes often remain sick longer, which increases the costs of health care and is an added financial burden to the family and to society.

**Q . Does this mean that only those populations living in developing countries are threatened by resistance?**

**A .** No. Antimicrobial resistance is a global problem requiring a global solution. No single nation, however effective it is at containing resistance within its borders, can protect itself from the importation of resistant pathogens through travel and trade. Poor prescribing practices in any country now threaten to undermine the effectiveness of vital antimicrobials everywhere.

**Q . Which specific diseases are most affected?**

**A .** The bacterial infections which contribute most to human disease are also those in which emerging resistance is of most concern: diarrhoeal diseases such as dysentery, respiratory tract infections, including multi-resistant tuberculosis, sexually transmitted infections such as gonorrhoea, and hospital-acquired infections. Among the other major infectious diseases, the development of resistance to drugs commonly used to treat malaria is of particular concern, as is the emerging resistance to anti-HIV drugs.

**Q . Why are hospital-acquired infections so dangerous?**

**A .** Hospitals are a critical component of the antimicrobial resistance problem worldwide. The combination of highly susceptible pa-

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tients, intensive and prolonged antimicrobial use, and cross-infection has resulted in so-called “nosocomial infections” with highly resistant bacteria. These infections are expensive to control and extremely difficult to eradicate. Hospitals are also the eventual site of treatment for many patients with severe infections due to resistant pathogens acquired in the community. In the wake of the AIDS epidemic, the prevalence of such infections can be expected to increase.

**Q . Does the use of growth promoters and other drugs in food-producing animals contribute to the problem?**

**A .** Yes. The enhanced food requirements of an expanding world population have led to the widespread routine use of antimicrobials as growth promoters or preventive agents in food-producing animals and poultry flocks. In North America and Europe, an estimated 50% in tonnage of all antimicrobial production is used in food-producing animals and poultry flocks. Such practices have contributed to the rise in resistant microbes, which can be transmitted from animals to humans; for example salmonellosis.

**Q . What can be done?**

**A .** A global problem of this magnitude and potentially devastating consequences requires a global solution, with urgent action across all nations and all sectors concerned. WHO has

taken a leadership role in alerting the international community to the severity of the problem and defining the specific actions that need to be taken.

In September 2001, WHO launched the first global strategy aimed at containing the emergence and spread of resistance. Known as the WHO Global Strategy for Containment of Antimicrobial Resistance, the strategy recommends a large number of interventions that can be used to slow the emergence and reduce the spread of resistance in a diverse range of settings.

**Q . Who needs to take action?**

**A .** Those called upon to be alert to the problem and take appropriate action include consumers, prescribers and dispensers, veterinarians, and managers of hospitals and diagnostic laboratories as well as national governments, the pharmaceutical industry, professional societies, and international agencies.

In advocating widespread adoption of this strategy, WHO aims to encourage the urgent actions needed to reverse or at least curtail trends which have major economic as well as health implications. Moreover, in view of the global nature of the antimicrobial resistance problem, the efforts of any nation to implement the WHO Global Strategy are likely to be felt worldwide.



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