

**Antibiotic Resistance Crisis**

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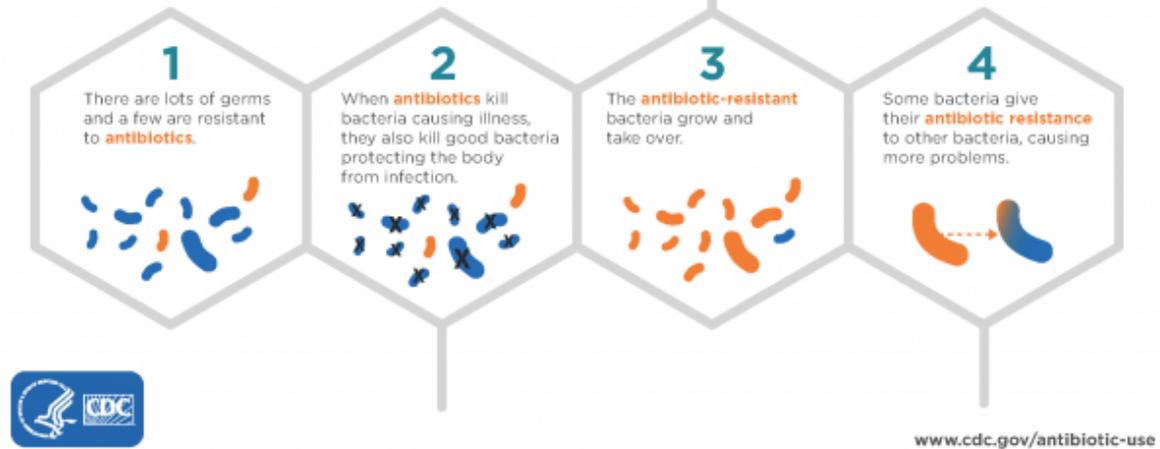
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Antibiotic resistance is becoming a crisis throughout the world today. There are a number of bacteria that are resistant to antibiotics. There are a number of causes contributing to the global antibiotic resistance crisis. These causes include overprescribing of antibiotics, agricultural antibiotic use and wrongfully prescribed antibiotics. Due to the growing numbers of antibiotic resistant bacteria, there are many infections that are incredibly difficult to treat. Bacteria are ever-changing, making the production of antibiotics to treat any infection, especially known resistant bacteria, challenging. The approach in how to handle this global crisis is ever-evolving. As new information about antibiotic resistant bacteria is uncovered, it gives scientists leverage on how to study, detect and therefore, treat the resistance. “CDC’s AR Solutions Initiative invests in national infrastructure to detect, respond, contain, and prevent resistant infections across healthcare settings, food, and communities” (CDC, 2020). In order to get a good handle on the crisis, the issue is addressed globally by public health officials all over the world.

Antibiotic resistance is essentially bacteria and fungi that evolve and become resistant to the antibiotics that could be used to treat them. The use of antibiotics began when penicillin was first discovered by Sir Alexander Fleming in 1928. Soon after, he warned that antibiotics would become a demand and overused. “As early as 1945, Sir Alexander Fleming raised the alarm regarding antibiotic overuse when he warned that the “public will demand [the drug and] ... then will begin an era ... of abuses.” (Ventola, 2015). Since then, antibiotics have become a popular way to treat many infections. There are a number of specific threatening antibiotic resistant bacteria.

## HOW ANTIBIOTIC RESISTANCE HAPPENS



Some of these, for example, are Carbapenem-Resistant Enterobacteriaceae, *Streptococcus Pneumoniae* and Methicillin-Resistant *Staphylococcus Aureus*. Carbapenem-Resistant Enterobacteriaceae or CRE, are bacteria that are found within the digestive tract and in the environment. E. Coli and Salmonella are well known pathogens. These can make their way into the human body through contaminated food and water. If this happens, the bacteria can get outside of the gut and cause infections in other area of the body like the bloodstream, urinary tract, and wounds. These infections often occur at catheters and surgical sites. These are most commonly occurring in the hospital setting, which are referred to as HAI's. *Streptococcus Pneumoniae* mainly causes pneumonia and lung infections. However, this bacteria can also cause anything from sinus infections to more serious infections like meningitis and bacteremia. *Streptococcus Pneumoniae* is spread through droplets, like that of sneezing and coughing when in close proximity to an infected person. There are a number of symptoms associated with this bacteria. Some of the worst effects include brain damage, hearing loss and death. Methicillin-Resistant *Staphylococcus Aureus* or MRSA, is common in about 30% of the population. This bacteria is found in the nose and on the skin of healthy people. When this bacteria enters a wound, however, it can pose a serious threat to infection. MRSA is usually just a skin infection

when seen outside of a hospital setting. When in a hospital setting, it can pose serious life threatening infections such as that of the bloodstream, pneumonia and surgical-site infection. MRSA is resistant to many different antibiotics. Not only is bacteria ever changing, but it is evolving so rapidly that bacteria essentially has the ability to outsmart the antibiotics we commonly have on hand. “New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases” (World Health Organization, 2020). The overuse and overprescribing of antibiotics has a huge impact on how bacteria evolve today. Overprescribing antibiotics is common practice, even in raising livestock. “Several studies have revealed that treatment indications, agent choice, and antibiotic therapy duration are inappropriate in 30%–50% of the cases” (Aslam, et al., 2015). Antibiotic consumption and new antibiotic resistant bacteria are directly related. This is because of something called horizontal gene transfer, or HGT which allows antibiotic resistance to be transferred between many different species of bacteria. Overprescribing of antibiotics makes a patient more susceptible to complications. Antibiotic resistance can also occur through consumption of food. This is due to the antibiotics that are used as growth supplements for livestock. So, without knowing it, your body is exposed to a number antimicrobials. Due to the number of ways antibiotic resistance happens and the ever-changing bacteria, the resistance to antibiotics is becoming a major health concern across the globe.

It is a growing concern that more and more bacteria are becoming resistant to antibiotics. As discussed before, there are a number of reasons for this. But the consequences of a post antibiotic world are huge. “Just one organism, methicillin-resistant *Staphylococcus aureus* (MRSA), kills more Americans every year than emphysema, HIV/AIDS, Parkinson’s

disease and homicide combined” (Llor, et al., 2014). In the past, it was a common thought that antibiotic resistance happened mostly within healthcare settings. While this still holds true, some resistance is acquired within the community too, and it is concerning particularly because these infections are easily transmitted. With infections occurring more frequently due to the increasing numbers of resistant bacteria, the cost of healthcare is estimated to increase. For each patient that acquires an infection within a hospital setting, it costs extra money in order to treat that patient properly. The complexity of antibiotic resistant bacteria often requires lengthy hospital stays. In addition to growing concerns about costs, the WHO has stated if antibiotics no longer work as they should, it will be detrimental to the work that has been done over the last 100 years in medical advancement. Because of the rate of antibiotic resistant infections growing, the World Health Organization, along with individual health organizations have begun extensive research on how to combat the battle of antibiotic resistance, and salvage the work of many who have developed antibiotics in order to save lives for years to come.

In order to combat antibiotic resistance, the WHO (World Health Organization), along with many other health organizations across the globe have set forth efforts to minimize the long lasting effects of antibiotic resistance. Due to the rising statistics in antibiotic resistant infections, especially those that are acquired in healthcare settings, scientists and health professionals are working to fight the overuse and overprescribing of antibiotics, as well as minimizing healthcare-associated infections. There are many ways that antibiotic resistance can be fought, some of which include: collectively fighting the issue with other nations, use less antibiotics, development of new antibiotics, avoiding the antibiotic use in animals, and many more. “The actions must combat the spread of antibiotic resistance, reinvigorate the development of new

antibiotics, and prolong the effectiveness of current and new antibiotic therapies. Therefore, we offer eight additional actions that the U.S. government and the private sector can take to combat antibiotic resistance” (Metz et al., 2014). Health care professionals play a huge role in the spread of antibiotic resistant bacteria. Whether it is the prescribing doctor, or a nurse taking care of an ill patient, each person plays a part in controlling the future of antibiotic resistance. Prescribing doctors can help fight this issue by prescribing less antibiotics in general. This means only prescribing antibiotics when they are actually necessary, and taking the proper steps to determine whether they are. All healthcare professionals can practice cleanliness, especially hand hygiene. Another part of the battle is the ability to develop new antibiotics that will effectively combat infection. Many drug manufacturing companies are discouraged from producing new antibiotics due to the testing and mass clinical effectiveness requirements. Although there are new antibiotics on the market currently, none have proven to be effective against most antibiotic resistant bacteria. The use of antibiotics in animals can also be addressed by overview of veterinary care when administering antibiotics to animals, and avoiding antibiotic use for the purpose of growth supplements. There are many people and organizations involved and responsible for the future of antibiotic resistance.

The resistance of antibiotics is not a new issue. Antibiotic resistant infections are common today, especially in healthcare settings. It is important, not only for the health and safety of patients, but the healthcare industry as a whole, that this issue be fought swiftly due to the great risks involved. “Without urgent action, we are heading for a post-antibiotic era, in which common infections and minor injuries can once again kill” (World Health Organization, 2020). Since 1945 when antibiotics began surfacing as a common treatment plan, resistance has been

trailing behind. Bacteria are always changing, meaning healthcare researchers are usually one step behind. There is a great possibility the world may face a post-antibiotic era, however, there is a possibility that it can be combatted and resolved with the steps put into place by health organizations from all around the world who have come together to stop the devastating effects of antibiotic resistance.

## Resources

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