

World Health Organisation

Combating antibiotic resistance



Forum	World Health Organisation
Issue:	Combating antibiotic resistance
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Introduction

Antibiotic resistance is an issue that affects people worldwide. A challenge to global public health. A threat to medical achievements made over the centuries. Antibiotic resistance occurs when bacteria evolve to withstand drugs that are intended to kill them such as antibiotics. This phenomenon has been accelerated due to various human activities. Ranging from the overuse of antibiotics in medicine to misuse in agriculture. As a result, infections that were once easily treatable are becoming increasingly difficult to treat. This causes higher mortality rates, increased stays at hospitals, and boosted healthcare costs.

The World Health Organisation (WHO) has recognized antibiotic resistance as one of the top ten global challenges, understanding that if the current trend is to continue, approximately 10 million deaths could be caused annually by 2050. This is a shocking number but justified antibiotics are necessary in modern medicine and essential for treating bacterial infections, preventing surgical infections, and assisting with conditions such as cancer. A resistance being formed to these has detrimental effects on any possible use of antibiotics. Furthermore, a cascading effect is also seen in the economic aspect. The antibiotic industry is worth around 70 billion USD. This means that not only does antibiotic resistance undermine public health treatments but it negatively impacts the healthcare industry.

Current efforts to combat antibiotic resistance are not enough. If not acted upon soon the impacts will be irreversible. Therefore it is a global responsibility to combat this issue. We must implement measures that include public welfare, healthcare, agriculture, and strategic approaches to mitigate its effect.



Definition of Key Terms

Antibiotic Resistance

The ability of bacteria to survive and grow in the presence of antibiotics that would normally kill them. This resistance can occur through genetic mutations or the mutation of resistance genes.

Antibiotics

Drugs are used to treat bacterial infections by killing bacteria. They are ineffective against viral infections.

Bacteria

Microscopic, single-celled organisms that can exist either as independent entities or as parasites. Some bacteria can cause diseases in humans, animals, and plants.

Mutations

Changes in the DNA sequence of an organism. In bacteria, mutations can lead to antibiotic resistance by altering the target site of the antibiotic or affecting the mechanisms that regulate drug entry or efflux.

Antibiotic Stewardship

A set of coordinated strategies to improve the use of antibiotics, including optimizing the selection, dosage, and duration of antibiotic treatment to achieve the best clinical outcomes while minimizing adverse effects and the development of resistance.

Horizontal Gene Transfer

The process by which bacteria acquire genetic material from other bacteria, rather than inheriting it from parent organisms. This can facilitate the spread of antibiotic resistance genes.

Overprescription

Inappropriate prescribing practices in healthcare settings lead to unnecessary use of antibiotics.



Selection pressure

When an environment forces genetic evolution or mutation, commonly seen in bacteria.

Patient Non-Compliance

Patients often fail to complete antibiotic courses, allowing some bacteria to survive and develop resistance. Incomplete treatment can also encourage the growth of resistant strains.

Agricultural Use

Extensive use of antibiotics in livestock to promote growth and prevent disease contributes to the spread of resistant bacteria. Resistant bacteria from animals can transfer to humans through the food chain and direct contact.

Inadequate Sanitation

Poor infection control practices in healthcare facilities and communities facilitate the spread of resistant bacteria. Inadequate sanitation and hygiene contribute significantly to the dissemination of resistant strains.

General Overview

The WHO is concerned with the rise in antibiotic resistance through the years because this has terrible effects around the world, in health care and throughout. To combat this we must work towards measures to reduce factors that may accelerate the spread.

Several factors contribute to antibiotic resistance, including the overprescription of antibiotics, their widespread use in agriculture, poor infection control practices, and inadequate sanitation and hygiene. Understanding these factors and addressing them is crucial to combating antibiotic resistance and ensuring antibiotics remain effective in the future.

Overprescription of Antibiotics

One of the main causes of the growing problem of antibiotic resistance is the overprescription of antibiotics. Antibiotic abuse and misuse have accelerated the development of



resistant bacteria, even though antibiotics are essential for treating bacterial diseases. There are various reasons for this. Most frequently it is misinformation that taking antibiotics as a preventive measure is a viable action. This is not the case and accelerates antibiotic resistance. Prescribing antibiotics in a situation where it is not required or is not even effective allows for different strains of bacteria to mutate and develop resistance. Then through the process of horizontal gene transfer, this can be transmitted to even more deadly bacteria.

Uncertainty regarding diagnosis is a major contributing factor to the overprescription of antibiotics. Clinicians frequently struggle to tell the difference between viral and bacterial illnesses only from clinical signs. Medicines are provided as a preventive measure when precise diagnostic testing is not available. This means that antibiotics are being prescribed even though they are not required to treat the patient. It is being used as a preventive measure. While some may think this is viable. In reality, the contribution to antibiotic resistance is too great of a threat to ignore. This type of overprescription is very commonly seen in less economically developed countries (LEDCs).

Time constraints and restricted access to diagnostic tools might result in the overprescription of antibiotics in busy clinical settings. Doctors may administer antibiotics as a precautionary measure because they don't have enough time to wait for the results of diagnostic tests or to fully explore the infection's origin. This is more common in LEDCs. This may be due to a lack of proper education for these doctors. Some LEDCs may not even require a prescription for antibiotics and this allows people to freely purchase antibiotics in case of every infection. Children in LEDCs are subject to overprescription of antibiotics. In the first 5 years, these children are receiving 25 antibiotic prescriptions on average. This number is ridiculously high. In most cases, these prescriptions are not required, and are being used as a preventative measure. This hurts not only the children but the global population.

Patient Demand

When patients visit healthcare professionals for illnesses, they typically expect to receive antibiotics regardless of whether they are necessary. They do this because they are uneducated on the topic of antibiotics. They do not understand when to use it, only having seen its capabilities against bacterial infections they expect the same result with sicknesses that are not bacterial. To uphold patient satisfaction and satisfy patient expectations medical care providers are pressured into prescribing antibiotics. Patient demand for antibiotics is a real threat to rising antibiotic resistance. A



way in which we can combat this is through education campaigns as well as banning misinformation regarding antibiotics. These are key issues and why patient demand can contribute so heavily to the genetic mutation of bacteria, linking directly to the next cause.

Inadequate Education and Training

It's possible that individuals and healthcare professionals are not properly educated on the dangers of antibiotic resistance and how to take antibiotics properly. Antibiotic prescribing may not always be what is needed in a given situation, and patients may not be aware of the risks associated with not adhering to the given schedule. Certain pharmacists will self-prescribe to patients to increase their revenue, but the patient does not have the funds to check this information or go visit a doctor. So therefore they rely on this information and purchase antibiotics without truly understanding what effects it is having. These antibiotics are frequently reused or shared amongst people. All of this negatively contributes to rising antibiotic resistance. The combination of misinformed doctors or pharmacy employees to patients who are unaware of what their condition is and how to combat it is a deadly strike in global antibiotic resistance.

Use of Antibiotics in Agriculture

The use of antibiotics in agriculture is one of the most significant factors contributing to antibiotic resistance. They are significantly used in livestock production, to increase growth and nutritional absorption. They may also be used to prevent diseases and cure illness in livestock. These animals contain bacteria that, due to selection pressure, are forced to mutate and evolve, developing resistance to antibiotics. Then using Horizontal gene transfer, they can share these genes with other more deadly bacteria that could infect humans.

When antibiotics are used as a growth booster, it is mainly done by feeding the animals small doses of antibiotics. This causes certain micro bacteria in the intestine to die and then absorb nutrients better. The issue with this is that this creates an environment in which bacteria are forced to evolve to survive. In turn, they develop resistance to these impotent doses of antibiotics. The reason farmers do this is because it greatly increases the growth of their livestock. Allowing them to have a greater profit and preemptive striking against any sickness the animal may have had. The antibiotics also help feed efficiency, reducing costs there. Therefore it is more profitable for a farmer to purchase antibiotics than to purchase more fodder, unaware or ignorant of the global problem this creates.



Another reason farmers use antibiotics on their livestock is to prevent many bacterial diseases that may be caused. This is done to ensure the farmer won't be losing any of the livestock to a disease and can rely on the income it will generate. They are also used in much heavier dosages if the livestock show signs of sickness. These farmers need to be given more funding or assistance in regards to how to combat these things without the use of antibiotics otherwise we will find ourselves unable to react to the problem at hand.

Poor Infection Control

We try everything to avoid creating bacteria that are resistant to antibiotics. Inevitably they are created. Therefore another issue in the rise of antibiotic resistance is that bacteria that have already evolved or mutated are not adequately contained. This causes them to spread and share their DNA traits with other bacteria, resulting in those bacteria spreading and sharing their DNA. This causes a cascading effect and may render our antibiotics useless to humans. Multiple things are going wrong for these bacteria to so easily spread. Some of these things are inadequate hand hygiene, insufficient sterilization, lack of isolation, overcrowding, and understaffing. With these issues at hand, the threat of antibiotic resistance will continue to grow. We must tackle each one individually. The lack of hygiene is a major problem.

Hygiene

Hygiene plays a major role in why these bacteria are spread from one person to another. Awareness campaigns would be able to tackle this issue easily but sadly there is not enough funding to reach the population that this concerns. Washing your hands is one of the most basic and important measures to keep yourself and others safe from bacteria. This must be made more clear along with the effects it may have globally if not done correctly. Makeshift hospitals and nursing areas are a breeding ground for bacteria due to unsterile equipment which contributes to rising antibiotic resistance. To tackle these we could create an inspection force to check and assist if able to. Hygiene is a very solvable issue if we were to pour some effort and funding into it.



Major Parties Involved

World Health Organization (WHO)

The World Health Organization has made it a priority to tackle the problems caused and created by antibiotic-resistant bacteria. They made it one of the 10 goals they aim to achieve. They are very proactive and want to make a positive impact.

Centers for Disease Control and Prevention (CDC)

The CDC is prominently involved in tackling antibiotic resistance. They have launched several initiatives in The United States of America. All making an impact and combating the rise of antibiotic resistance. They actively collect data and surveillance to continue to make new changes and updates to their program.

China

China has developed a national action plan to tackle antibiotic resistance, focusing on both healthcare and agriculture. The country aims to prevent antibiotic use and resistance, promote research and development of new antibiotics, improve public and professional awareness about the risks of antibiotic resistance, and implement stricter regulations on the sale and use of antibiotics.

India

India also sees this as a major threat to society. They have taken major action against this happening and have created many educational programs and awareness campaigns to show this to the people. They have also created inspection agencies to try and mitigate the spread of this bacteria.

G20 Countries

The major economies of the world have all recognized the importance of this issue. They have all committed to working towards measures to prevent this. They have committed themselves to work towards these at a national and international level, pledging their support to the cause.



Timeline of Key Events

Date	Description of event
September 28, 1928	Alexander Fleming discovers penicillin, marking the beginning of the antibiotic era.
July 1, 1945	Penicillin is used to mass-produce antibiotics
1960s-1970s	Reports of antibiotic-resistant bacteria begin to surface, including methicillin-resistant Staphylococcus aureus (MRSA).
October 1, 1998	The World Health Organization publishes its first global report on antibiotic resistance, showing the growing threat.
September 20, 2001	The WHO launches a global strategy to contain antimicrobial resistance, outlining measures for governments and healthcare providers.
May 25, 2015	The WHO adopts the Global Action Plan on Antimicrobial Resistance, urging countries to develop national action plans.
March 11, 2020	The World Health Organization declares COVID-19 a pandemic. The pandemic highlights the importance of infection control and the challenges of treating secondary bacterial infections, exacerbating concerns about antibiotic resistance.



UN involvement, Relevant Resolutions, Treaties and Events

- • Political Declaration of the High-level Meeting of the General Assembly on Antimicrobial Resistance, September 21, 2016 (A/RES/71/3)
- • Global Health and Foreign Policy: Health Employment and Economic Growth, December 13, 2017 (A/RES/72/139)
- • Global Health and Foreign Policy: Addressing the Health of the Most Vulnerable for an Inclusive Society, December 10, 2018 (A/RES/73/132)
- • Global Health and Foreign Policy: An Inclusive Approach to Strengthening Health Systems, December 12, 2019 (A/RES/74/21)
- • United Nations Political Declaration on Universal Health Coverage, September 23, 2019 (A/RES/74/2)

Previous Attempts to Solve the Issue

The WHO has made previous attempts to come up with a solution to this dire problem. One of them is the WHO Global Strategy for Containment of Antimicrobial Resistance (2001). This strategy was a structure or framework to combat all the issues that add up to this bigger issue. This included recommendations for surveillance, infection control, rational use of antibiotics, and research into new treatments.

This strategy greatly helped in raising awareness about antibiotic resistance and allowed for multiple awareness campaigns to take place. Since this strategy was a framework it allowed other nations to use it as a foundation for building their own national and more specific strategies. However, the major flaws started appearing as time went on. The same countries that had pledged to adopt this framework refused to or were unable to fully implement this due to lack of funding or incompetent framework. The lack of continued surveillance and robust international cooperation were also fatal blows that rendered this solution ineffective.

The United States National Action Plan for Combating Antibiotic-Resistant Bacteria (2015) was another type of solution. This time it was extremely focused on a single national government and included plans to boost antibiotic stewardship. As well as develop new drugs and set an example for international cooperation in the future.



This plan led to significant improvement of antibiotic stewardship which allowed for research dedicated to other drugs to be used as a substitute. As well as well-implemented surveillance projects. However, the downfall of this proposed solution was the fragmented nature of the US healthcare system. Decreased funding and the inability to change public prescription behavior led to this solution being rendered obsolete.

The challenge with creating a solution for this issue is that it must be both globally fitting and it must allow for nations to define their guidelines with what works best for them. It must also take into account the limited funding received. As well as combatting public opinion on the matter with educational campaigns. The lack of any of these elements leads to the entire resolution or solution being but an idea and not a real solution.

Possible Solutions

We should reflect on previous attempts made by the WHO and the US government to try and combat rising antibiotic resistance and we should learn from them. A few key things are necessary. Firstly enhanced monitoring is a necessity to identify where the bacteria is spreading and how to further combat it. As well as giving us tremendous data to use to help guide any future activity.

Secondly, we must provide and encourage antibiotic stewardship. Implementing programs in local hospitals has a rewarding effect. Education and training for healthcare personnel as well as financial incentives can both be viable tools for implementing antibiotic stewardship. Furthermore, these same funds can be used to research and develop other drugs that are good substitutes for antibiotics allowing us to take the strain off antibiotic stewardship programs.

To enforce these changes extremely strict regulatory measures must be put in place with the creation of an inspection body. The Antibiotic Vigilance Commission (AVC) would be in charge of making sure a state's rules and regulations are up to date and correspond accordingly to the framework set up by the WHO. This committee's function will be essential in combating both overprescription and patient demand. This committee would be divided into sub-committees to tackle each issue such as the Antibiotic Vigilance Commission for Public Awareness would be one wing of this committee that would be focused on this specific issue. This ensures that this committee is not burdened by various issues and can maintain a proper framework to combat antibiotic resistance. This committee would report directly to the WHO and would receive funding from both



international and by request national agencies in exchange for developing healthcare and completing their intended function.

As touched upon briefly before public awareness campaigns would be another issue this committee would tackle and open a separate wing for. These campaigns would be capable of swinging public opinion and allowing for patient demand to stop swelling. As well as educate people on when and when not to use antibiotics as well as the accompanying dangers.

Creating another wing within the AVC called the AVC for farmers would take direct action against the use of antibiotics in livestock feed. Therefore incentivising farmers to take this approach to increase income or spend less on fodder. Fines are quite an effective way to do this. This would however mean that the AVC for farmers would be in close collaboration with national governments and any national healthcare agency as well as national monetary agencies to ensure all of this is possible.

The AVC would also be on the lookout for responsible use of Antibiotics and progress towards antibiotic stewardship would be rewarded with financial incentives. Allowing us to involve private healthcare and research facilities without much of a hassle. Providing financial incentives allows for contributions to be rewarded accordingly and larger contributions rewarded more than lesser ones. This incentive would allow the AVC to motivate both national governments and the private sector to work collaboratively toward combating antibiotic resistance. These possible solutions include previous solutions as well as new ones that allow for a framework for national governments to follow and an international agency specifically tasked with dealing with this. These solutions address both old and new concerns and try to make sure they don't become obsolete like previous attempts.

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Appendix or Appendices

Appendix I

National Library for Medication Report on Antibiotics

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4378521/>

Appendix II

WHO report on Antibiotic Resistance.

<https://www.who.int/news/item/09-12-2022-report-signals-increasing-resistance-to-antibiotics-in-bacterial-infections-in-humans-and-need-for-better-data>

Appendix III

European Centre for Disease Prevention and Control report on AMR

<https://www.ecdc.europa.eu/en/antimicrobial-resistance>

Appendix IV

United Nations Environment Programme(UNEP) global threat of AMR

<https://www.unep.org/topics/chemicals-and-pollution-action/pollution-and-health/antimicrobial-resistance-global-threat>

