AtidMUN X 2024

WHO STUDY GUIDE

TOPIC A: WATER-BORNE DISEASES IN NATURAL DISASTERS

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Chair Letter

Dear distinguished delegates,

We, Lihi Knop, Gabrielle Meyer, and Shaked Keysy, would like to welcome you all to ATIDMUN 2024, the World Health Organization committee! It is the crucial committee of the UN, the World Health Organization! It is our honor to be your chairs in this exciting conference, and we hope to provide you with a fun and educational experience. We are committed to ensuring delegates have the materials they need for the conference. We expect everyone to fulfill their responsibilities as delegates to maintain a high-level debate.

We look forward to meeting you all and hope this study guide provides you with all the information you need!

Sincerely,
Your future chairs.

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TOPIC A: WATER-BORNE DISEASES IN NATURAL DISASTERS

BACKGROUND TO THE ISSUE:

DEFINITIONS

The National Institute of Medicine defines natural disasters as "disturbances in the ecosystem that impede a native community's ability to adapt, often requiring external interventions for survival."[1] Natural disasters are classified by hydrologic (relating to water), atmospheric (relating to air, wind, weather), and geologic (relating to earth) events. Some examples of natural disasters that may be familiar are Earthquakes, Tsunamis, Tornados, Hurricanes, etc. In this committee, we will be focusing on hydrological disasters. More specifically, waterborne diseases are present in these disasters.

The United Nations Institute for Disaster Risk Reduction (UNDRR) defines waterborne diseases as "diseases transmitted by ingesting contaminated water." The UNDRR also mentions a few common diseases contracted through the ingestion of water, such as cholera, shigella, typhoid, hepatitis A and E, and poliomyelitis.

As of late, natural disasters have mainly impacted many countries worldwide and have had devastating effects. On June 18th, Brazil faced an outbreak of waterborne diseases due to a flood. A man named Corvello Cunha set out to help the affected people; however, during his efforts, he ingested contaminated water and was infected with Leptospirosis.

BANGLADESH'S 2004 FLOOD-INDUCED DIARRHEAL OUTBREAK

Following a severe flood in Bangladesh in 2004, the WHO addressed a significant outbreak of diarrheal diseases. The floods contaminated drinking water sources, resulting in over 17,000 cases of diarrheal disease[2]. The bacteria identified included Vibrio cholerae and enterotoxigenic Escherichia coli. The WHO's efforts focused on providing clean water, improving sanitation, and distributing medical supplies to control the outbreak and prevent further spread of disease.

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[1] ncbi.nlm.nih.gov/pmc/articles/PMC6195322/

[2] https://ko.fm/8zi

HISTORICAL CONTEXT

- In 1998, Hurricane Mitch caused devastating floods in Honduras and Nicaragua, which resulted in an epidemic of leptospirosis and other diarrheal diseases due to contaminated water sources. Due to contamination of water sources and a lack of clean drinking water and proper sanitation, the disease and other gastrointestinal infections spread through the water.
- In 2004, a tsunami in the Indian Ocean contaminated freshwater sources and impacted water and sanitation infrastructure, resulting in a severe cholera outbreak. The tsunami created conditions where cholera could quickly spread, which only exacerbated the public health crisis in the affected regions.
- In 2005, the Kashmir earthquake in Pakistan destroyed water sources and disrupted water supplies, which led to an outbreak of gastroenteritis as well as other diarrheal diseases within the region.
- Similarly, the 2010 earthquake in Haiti resulted in another devastating outbreak of cholera. Those affected were left with a lack of clean water and sanitation facilities. The destruction of infrastructure created conditions ripe for the spread of cholera.

CAUSES AND RISK FACTORS

Natural disasters like floods, hurricanes, and earthquakes can devastate water sources and sanitation systems, often resulting in widespread contamination and disease outbreaks[3]. During flooding events, overflowing water can mix with sewage, agricultural runoff, and industrial waste, introducing harmful pathogens, chemicals, and debris into drinking water supplies. Earthquakes and landslides can rupture underground pipes and damage water treatment facilities, allowing contaminants to enter the water system. In coastal areas, hurricanes and tsunamis can cause saltwater intrusion into freshwater aquifers, rendering them undrinkable.

The destruction of water and sanitation infrastructure during disasters creates ideal conditions for waterborne diseases to spread rapidly. Damaged pipelines, treatment plants, and distribution systems may be unable to deliver safe drinking water or properly dispose of sewage. This can

[3] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1626162/

contaminate remaining water sources with bacteria, viruses, and parasites that cause illnesses. The lack of proper sanitation often forces people to resort to open defecation, further polluting water sources and increasing disease transmission risks.

Mass displacement of populations following disasters exacerbates these public health threats. Overcrowded shelters, rural areas, and refugee camps frequently need more water and sanitation facilities to serve many people. Limited access to clean drinking, cooking, and hygiene water makes it difficult to maintain sanitary conditions and prevent the spreading of infectious diseases. As people are forced to rely on contaminated water sources or ration their water use, the risks of dehydration and waterborne illnesses increase dramatically. Population displacement, infrastructure damage, and environmental contamination can quickly lead to widespread disease outbreaks that overwhelm local healthcare systems and prolong the disaster's impact on affected communities.

TYPES OF WATER-BORNE DISEASES

Water-borne diseases are illnesses caused by pathogenic microorganisms transmitted primarily through contaminated water. These diseases remain a significant public health concern, particularly in areas with inadequate sanitation and limited access to clean water.

Cholera is caused by the bacterium Vibrio cholerae and is characterized by severe watery diarrhea, vomiting, and dehydration. It spreads through ingesting water or food contaminated with the feces of infected individuals. Typhoid fever, caused by Salmonella typhi bacteria, presents with a high fever, abdominal pain, and sometimes a rash. It is transmitted similarly to cholera through the fecal-oral route.

Dysentery comes in two primary forms: bacillary dysentery (shigellosis), caused by Shigella bacteria, and amoebic dysentery, caused by Entamoeba histolytica. Both types lead to bloody diarrhea, abdominal cramps, and fever. These pathogens spread through contaminated water, unwashed hands, and food prepared in unsanitary conditions. Hepatitis A, a viral infection affecting the liver, causes jaundice, fatigue, and abdominal pain. It is transmitted through ingesting contaminated water or food or close contact with infected individuals.

Other notable water-borne diseases include giardiasis, caused by the parasite Giardia lamblia, which leads to diarrhea, abdominal cramps, and nausea; and cryptosporidiosis, caused by Cryptosporidium parasites, resulting in watery diarrhea, stomach cramps, and mild fever. Both parasitic infections spread through contaminated water sources and often resist standard water treatment methods. Additionally, various strains of E. coli bacteria can cause severe gastrointestinal illness when ingested through contaminated water or food.

Transmission of Diseases

The transmission of these diseases often follows a cyclical pattern, where contaminated water sources lead to infection, and improper disposal of human waste further pollutes water supplies. This cycle is particularly problematic in areas with poor sanitation infrastructure or in the aftermath of natural disasters that disrupt regular water treatment and distribution systems. Prevention strategies focus on improving water quality, sanitation practices, and hygiene education to break this transmission cycle and reduce the incidence of water-borne diseases.

Hospitals and Vaccinations

In a natural disaster, many hospitals get overflooded with people bearing injuries and diseases due to contamination. This problem is especially prominent in rural areas with less medical infrastructure and staff. In addition, because of the lack of medical funds in third-world countries, many people have not been vaccinated for water-borne diseases even though they live in areas prone to such infections, thus spreading the diseases further due to inadequate vaccination and flooding the already-packed hospitals even more. Both factors should be considered. Even though stopping the problem at its root is important, sometimes that isn't enough.

Current Situation:

Recent Incidents of Waterborne Illnesses Due to Natural Disasters

In recent years, a disturbing increase in waterborne illnesses has been witnessed following natural disasters. Significant floods, prolonged droughts, and other catastrophic events have significantly heightened the risk of outbreaks. For instance, the 2023 floods in Libya resulted in widespread contamination of drinking water supplies, leading to Cholera and E. coli outbreaks. Similarly, in 2022, severe flooding in Pakistan precipitated the spread of waterborne diseases such as Cholera and the Norwalk virus, exacerbated by the inundation of sewage systems and water treatment facilities.

Although seemingly less directly associated with waterborne illnesses, droughts contribute significantly to the problem. Prolonged droughts often lead to compromised water sources, increasing the concentration of pathogens and making it difficult to maintain adequate sanitation. For example, the drought in East Africa in 2021 was linked to an uptick in waterborne diseases due to the limited availability of clean water and the subsequent reliance on unsafe water sources.

Efforts to prevent waterborne illnesses after natural disasters have evolved, including improved water purification techniques and enhanced disease surveillance systems. In regions prone to flooding, initiatives such as the rapid deployment of mobile water treatment units and increased access to oral rehydration solutions have been crucial. Public health campaigns focusing on hygiene and safe water practices have also been implemented to mitigate the risk of disease outbreaks.

Where This Situation Is Most Significant

The impact of waterborne diseases following natural disasters is particularly severe in certain regions. Sub-Saharan Africa[4], for example, remains highly vulnerable due to its frequent exposure to flooding and droughts, coupled with limited infrastructure for water treatment and sanitation. Countries such as Somalia and South Sudan frequently experience outbreaks of Cholera and other waterborne diseases during and after natural disasters.

South Asia is another region where this issue is profoundly significant. Bangladesh and India often face severe flooding during the monsoon season, leading to widespread contamination of water sources and subsequent disease outbreaks. For example, the 2020 floods in Bangladesh increased in Cholera cases, highlighting the critical need for improved water management and disaster response strategies.

In the Americas, the Caribbean region, particularly Haiti, faces a high risk due to its susceptibility to hurricanes and flooding. The 2016 Hurricane Matthew in Haiti led to a significant cholera

[4] https://www.afro.who.int/news/africa-faces-rising-climate-linked-health-emergencies

outbreak, underscoring the challenges faced by regions with fragile health infrastructure and limited resources for disaster response[5].

CURRENT SOLUTIONS AND POSSIBLE OUTCOMES

Technological advancements and international collaborations have led to innovative approaches to combating water-borne diseases in recent years. Remote sensing and satellite observation data have emerged as powerful tools for predicting, monitoring, and managing disease outbreaks. The ESA-funded project "Waterborne Infectious Diseases and Global Earth Observation in the Nearshore (WIDGEON)" exemplifies this approach, utilizing Earth observation data to enhance our understanding and prevention of water-borne diseases.

WIDGEON and similar initiatives leverage satellite imagery to map flooded areas, track water quality changes, and identify potential hotspots for disease outbreaks. By combining this data with ground-based measurements and epidemiological information, researchers can develop early warning systems for water-borne diseases. These systems enable public health officials to implement preventive measures more quickly and effectively, potentially averting large-scale outbreaks.

Remote sensing technologies offer several advantages in disease prevention. They provide wide-area coverage, allowing for monitoring vast regions impractical to survey using traditional methods. Satellites can detect changes in water bodies, land use, and environmental conditions that may increase the risk of water-borne diseases. For instance, they can identify areas of stagnant water following floods, which are potential breeding grounds for disease vectors.

Integrating satellite data with machine learning algorithms and predictive modeling has shown promising results. These tools can forecast disease risk based on environmental factors, population density, and historical outbreak data. By identifying high-risk areas in advance, resources can be allocated more efficiently for water treatment, sanitation improvements, and public health interventions.

Furthermore, using Geographic Information Systems (GIS) with satellite data allows for the creation of detailed risk maps. These maps can guide targeted interventions, such as distributing water purification tablets or deploying mobile health clinics to vulnerable communities. The visual

5 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6367609/

representation of data also aids in communicating risks to the public and policymakers, facilitating more informed decision-making.

While these technological solutions offer great potential, their effectiveness ultimately depends on their integration with on-the-ground action. Successful implementation requires collaboration between space agencies, public health organizations, local governments, and communities. Capacity building in data interpretation and application is crucial, particularly in resource-limited settings where the burden of water-borne diseases is often highest.

These technologies' continued development and refinement could lead to more robust and responsive public health systems. As data resolution and analysis techniques improve, we may see more precise predictions and faster response times to potential outbreaks. Additionally, integrating citizen science approaches, where local communities contribute to data collection through mobile apps or simple testing kits, could further enhance the effectiveness of these systems.

Combining global observation technologies with local knowledge and action presents a promising path forward in the fight against water-borne diseases. As these solutions continue to evolve and become more accessible, they have the potential to significantly reduce the global burden of these preventable illnesses, contributing to improved health outcomes and quality of life for millions of people worldwide.

Questions To Consider

1. What are the prevalent waterborne diseases in your country?
2. What is the state of the country's water infrastructure?
3. How are healthcare facilities prepared for an influx of waterborne disease cases?
4. What protocols are in place for monitoring and reporting waterborne disease outbreaks?
5. What measures are in place to prevent the spread of diseases from temporary sanitation issues?
6. What steps are being taken to prevent future outbreaks?
7. What role does international aid and collaboration play in the recovery process?
8. How is climate change being factored into future disaster preparedness and response plans?
9. What are the economic implications of waterborne disease outbreaks during natural disasters?

10. How do waterborne diseases impact the economy, particularly healthcare costs, lost productivity, and longer-term recovery?

Suggested Reading

https://pubmed.ncbi.nlm.nih.gov/21799407/

https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/waterborne_diseases#:~:text=Some%20common%20water%2Drelated%20illnesses,neurological%20systems%2C%20and%20other%20symptoms.

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Topic B: Preparing for a World Without Antibiotics

Introduction

The invention of antibiotics was a miracle like no other. It brought about a medical revolution and stood the test of time in the battle against otherwise life-threatening diseases. Despite that, human nature proved more potent than any miracle drug that came our way. Incentives in pharmaceutical and agricultural markets pushed us to overprescribe and wrongly prescribe antibiotics, worsening their efficiency over time.

You, the delegates, must work together over the course of the committee to find proper solutions to this quickly growing crisis. The chair team wishes you all the best in the conference.

So… What Are Superbugs, Exactly?

Antimicrobial resistance, better known as AMR, is an increasingly dangerous trait in microbes that leads to the creation of Superbugs: microbes resistant to the standard medicine we use today. While all kinds of microbes can become superbugs, including bacteria, viruses, and fungi, the most common kinds of superbugs are bacteria.

Improper antibiotic use has enabled bacteria to evolve and acquire resistance to medicine. Due to their resistance, superbugs have become a major threat even to the healthiest of people—a wound as simple as a paper cut, given the right conditions, might be fatal. In the status quo, 700,000 annual deaths are credited to superbugs, and experts on the Review of Antimicrobial Resistance estimate the death toll could reach 10 million annual deaths by 2050 and cost us $100 trillion in GDP [Goenka, 2016].

How did antimicrobial resistance become so common? To answer that, we need to go back to 1928, the year penicillin was invented:

Why Save Humanity When You Can Make More Money Instead?

The potential failings of antibiotics were apparent right from the start. Even Alexander Fleming himself, the discoverer of penicillin, admitted that antibiotics will be doomed to fail the moment humanity gets used to them. Despite countless warnings from Fleming and other scientists from the 40s and 50s, modern society drowned their voices due to the sheer demand for antibiotics had. Soon after World War II, pharmaceutical companies were already mass-producing penicillin and researching other antibiotics in the hopes of raking it in [Zimmer, 2016] - and they did. Today, the antibiotics industry is valued at $45.6 billion [Faizullabhoy Wani, 2024].

At the time, the medical community assumed that if penicillin, or any other drug, were no longer effective – they'd just switch to another drug. They believed that new medications would be created forever. As a result, antimicrobial resistance was not only a non-issue but good for business: Pharmaceutical companies could outsell each other's products by claiming it's "the newest in the market" and the most effective. Big Pharma began extensive research on new drugs, combinations of existing drugs, and entirely new treatments [Zimmer, 2016].

AMR would not have become a problem if not for one crucial detail in the pharmaceutical industry's plan to make it rain: pharmaceuticals began pressuring doctors to prescribe antibiotics more and more often. To this day, antibiotics are given out for almost anything – even the common cold, which isn't treatable with antibiotics (it's a virus!). Reform efforts in the 1960s on the issue of overprescription quickly fizzled out, and antibiotics have become more common than ever. According to the Journal of Internal Medicine, which conducted a study examining 51 million patients over a 15-year-long period, found that antibiotics were overprescribed 50% of the time [Intermountain Healthcare, 2023]. Apart from AMR, overprescription of antibiotics can lead to devastating side effects, such as the fact that antibiotics account for over 20% of all drug-related emergency department visits in the US [Bjerrum Llor, 2014].

Profit Goes Beyond Just Humans

The application of antibiotics expanded to human healthcare, agriculture, and husbandry. In the 1940s, farmers discovered that sub-therapeutic doses of antibiotics could improve the quality of animal products, promote animal growth, and create more efficient feeds [Flores-Tejeida, 2018].

Until the 1940s, farming was a risky business as livestock faced a constant battle against bacterial infections. Even the simplest of illnesses could be devastating - wiping out entire herds or leaving animals stunted and sickly. Take the chicken industry as an example: between 1945 and 1995, the mortality rate of chickens in BCP (Broiler Chicken Production) was cut in half [NCC, 2022]. This new technology allowed for more rampant use of antibiotics and more intensive farming practices: Farmers began keeping animals in increasingly denser containers and expanded their use of subtherapeutic doses of antibiotics to make animals require 50% less feed and gain 300% more weight [NCC, 2022]. By 2001, antibiotics in farming had grown to the point that, in the US, 90% of the total use of antibiotics was for agricultural production.

And so, while AMR was getting increasingly common in humans, the phenomenon skyrocketed among animals. As discussed previously, injecting antibiotics in subtherapeutic doses is the leading cause of antimicrobial resistance among animals. Simultaneously, the main principle behind modern farming is just that. As AMR grew increasingly common in animals, two significant ways to be infected with antibiotic-resistant bacteria have emerged: Direct contact with animals and food-borne infections.

It's straightforward regarding direct contact with animals: The risk is most significant among those in direct contact with the animals and their surrounding communities, which are 9.64 times more likely to be infected with AMR bacteria [Chen Wu, 2018]. A research paper 1976 documented the intestinal flora of husbandry workers in contact with livestock fed with antibiotic-supplemented feed and found significant amounts of AMR bacteria in farmers and their neighbors [Levy FitzGerald, 1976]. Agriculture workers are also at considerable risk of infection from animal manure, which often contains the antibiotic-resistant Staphylococcus aureus and methicillin bacteria [Chen Wu, 2018].

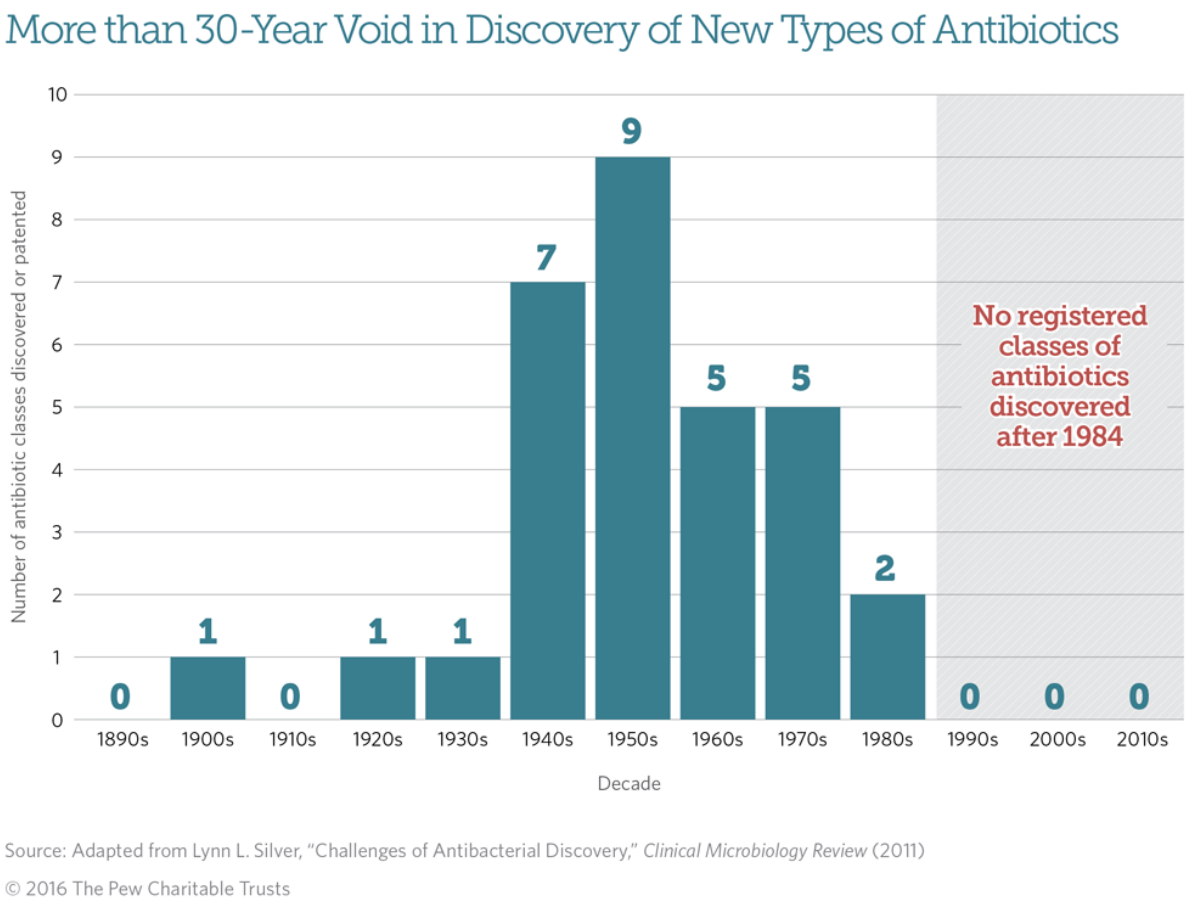
AMR-infected food products are also a standard method of infection other than direct contact with animals. Countries lacking health and food regulations may allow resistant bacteria to remain in animals through the consumer's plate. On the upside, this is only a problem in developing countries, where pasteurization is unaffordable, food preservation methods are lacking, and general hygiene is subpar. Developed countries don't exhibit such problems.

Current worldwide statistics on antimicrobial use amongst animals in husbandry estimate that 73% of the world's antibiotics are in farm animals. The use of agricultural antimicrobials is estimated to rise by 67% from 2010 to 2030 (Boeckel, n.d.). Knowing that, it comes at no surprise that the international community has not done much to tackle the problem. All the WHO did was dish out one report on the issue (WHO, 2017), while simultaneously arguing that there is no way to completely detransition from using antibiotics in agriculture (Hamaide, 2012).

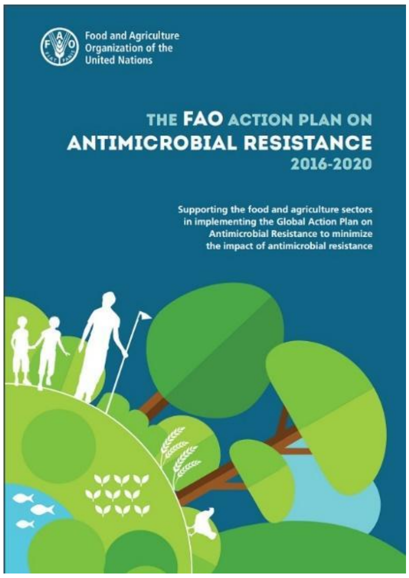
Restricting the use of antimicrobials in agriculture is projected to significantly reduce AMR rates, preventing resistant bacteria in animals by up to 39% (Lindmeier, 2017). And yet, despite the severe health consequences for humans, many argue that antimicrobials are the backbone of the meat industry. Antibiotics prevent mortality rates among farm animals; meat prices are projected to rise by 6.3%, even with partial antimicrobial use restrictions (Lhermie, 2020). Outright prevention of antimicrobial use in agriculture could make protein an unaffordable option for many families.

Antibiotics Went Out of Style

There is one easy, yet temporary, solution to antimicrobial resistance: Just make new drugs. The pharmaceutical industry rode on that wave in the 1940s, but that is no longer true. As of today, the clinical pipeline of new antibiotics is as dry as the Arizona desert. Out of 27 currently-researched antibiotics, only six were considered a little "innovative" by the WHO (WHO, 2023). Furthermore, there has been a 30-year gap in discovering new types of antimicrobials.



Researching antibiotics just went out of fashion. Worldwide, only around 3,000 doctors focus their research on antibiotics, as opposed to 46,000 focused on cancer research. The number of doctors listed as authors on research papers decreased by 50% in just 30 years.



Then, Are We Doomed? Not necessarily.

Our situation looks dire: the issue of antimicrobial resistance is one that we might fight against forever. Microbes will constantly evolve to gain resistance to the drugs we use on them. The international community must think long-term to find a suitable solution to the crisis.

And that's what we've begun doing: 2015 marked the beginning of the Global Action Plan on Antimicrobial Resistance, endorsed by Ministers of Health and Agriculture at the governing bodies of WHO, FAO, OIE, and Heads of State at a high-level meeting of the UNGA. More than 90% of the world's population lives in countries that practice a multi-sectoral national action plan on the issue [Sprenger, 2017]. The developed world is finding success in many areas related to reducing AMR in healthcare: training doctors, nurses, and other health workers on how to reduce the spread of antimicrobial resistance improving the prevention and control of infections, and strengthening systems to detect the extent of the problem. That year also marked the beginning of the GLASS program, which collects and shares data on antibiotic usage in humans and animals and monitors resistance trends. This standardized system helps countries improve data collection and policymaking, focusing on supporting low- and middle-income nations [WHO, 2023].

Regarding the healthcare system's lacking R&D efforts, the WHO has also begun encouraging the creation of new drugs, working alongside global medical organizations such as the Global Antibiotic Research & Development Partnership (GARDP), the AMR Action Fund, and the Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator (CARB-X).

Despite significant progress in finding a suitable solution to the problem, there are still many areas where our action has been lacking. AMR is most common in developing countries, and not much attention has been placed there (WHO, 2023). Discussions on the issue of antimicrobial usage in agriculture are still ongoing, and doctors are still overprescribing antibiotics to patients.

This is where you, the delegates, come into play. Use what's already been achieved and create systems and draft regulations that will manage the growth of this quickly emerging crisis.

Questions to Consider

Familiarizing Questions

- How developed is your country's healthcare system and infrastructure?
- How common is the overprescription of antibiotics in your country?
- Does your country have any regulations on the use of antibiotics in healthcare and in agriculture?
- Is your country creating incentives for the creation of new antibiotics?

CLASH-ORIENTED QUESTIONS

- What issue needs more focus: Overprescription in healthcare? In the farming industry? Or rather the lacking development of new drugs?
- In the case of agricultural antimicrobials, should we prioritize the economic benefit of overusing antimicrobials over the severe health consequences it brings about?
- Should new drugs be created to fight AMR, or is it a futile attempt to delay the problem?

FURTHER READING

- The Antibiotic Apocalypse Explained | Kurzgesagt,
- European Parliament Briefing | EUROPA

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