BHIS FAIRGAZE MUN
24th JULY

AGENDA
-
PROMOTING THE USE OF ALTERNATIVES TO ANTIMICROBIALS AND NEW TECHNOLOGIES FOR DIAGNOSIS AND VACCINES

LETTER FROM THE EXECUTIVE BOARD

Greetings Delegates,

We welcome you to the stimulation of of United Nations General Assembly in Fairgaze MUN 2021 . The letter is the first thing we expect to read before you move ahead with the background guide and the agenda.

Use this space to familiarise yourselves with the the committee and the expectations of the executive board and we would like to mention some important points.

As you might be knowing, the agenda for the committee is ″Promoting the use of Alternatives To Antimicrobials and New Technologies for Diagnosis and Vaccines ”.

Bacterial infections have been traditionally controlled by antibiotics and vaccines, and these approaches have greatly improved health and longevity. However, multiple stakeholders are declaring that the lack of new interventions is putting our ability to prevent and treat bacterial infections at risk. Vaccine and antibiotic approaches still have the potential to address this threat. Also Along with this you must also be aware of various economical and technical terms concerned with the Agenda.

This background guide has been prepared just for you to gather the basic understanding of the Agenda and keeping this in mind you should extend your research further it. In the session, the executive board will encourage you to speak as much as possible, as fluency, diction or oratory skills have very little importance as opposed to the content you deliver.

At the end of the day of we hope everyone have a wonderful debate with dexterous MUNers we expect you to come up with a meticulous conclusive document. We are certain that we will be learning from you immensely and we also hope that you all will have an equally enriching experience. In case of any queries feel free to contact us. We will try our best to answer the questions to the best of our abilities. Gmail Id′s are written along , All the best and see you all at the conference !

Regards ,

Adi Sharma - Chairperson (adisharma1301@gmail.com)
Yana Bedi – Vice Chairperson (bediyana19@gmail.com)

ALL THE BEST

ANTIMICROBIALS-

Key facts

- **Antimicrobial resistance (AMR) is a global health and development threat. It requires urgent multisectoral action in order to achieve the Sustainable Development Goals (SDGs).**
- **WHO has declared that AMR is one of the top 10 global public health threats facing humanity.**
- **Misuse and overuse of antimicrobials are the main drivers in the development of drug-resistant pathogens.**
- **Lack of clean water and sanitation and inadequate infection prevention and control promotes the spread of microbes, some of which can be resistant to antimicrobial treatment.**
- **The cost of AMR to the economy is significant. In addition to death and disability, prolonged illness results in longer hospital stays, the need for more expensive medicines and financial challenges for those impacted.**
- **Without effective antimicrobials, the success of modern medicine in treating infections, including during major surgery and cancer chemotherapy, would be at increased risk.**

What are antimicrobials?

Antimicrobials – including antibiotics, antivirals, antifungals and antiparasitics – are medicines used to prevent and treat infections in humans, animals and plants.

What is antimicrobial resistance?

Antimicrobial resistance occurs when microorganisms such as bacteria, viruses, fungi and parasites change in ways that render

the medications used to cure the infections they cause ineffective. When the microorganisms become resistant to most antimicrobials they are often referred to as “superbugs”. This is a major concern because a resistant infection may kill, can spread to others, and imposes huge costs to individuals and society.

Antimicrobial resistance is the broader term for resistance in different types of microorganisms and encompasses resistance to antibacterial, antiviral, antiparasitic and antifungal drugs.

Antimicrobial resistance occurs naturally but is facilitated by the inappropriate use of medicines, for example using antibiotics for viral infections such as cold or flu, or sharing antibiotics. Low-quality medicines, wrong prescriptions and poor infection prevention and control also encourage the development and spread of drug resistance. Lack of government commitment to address these issues, poor surveillance and a diminishing arsenal of tools to diagnose, treat and prevent also hinder the control of antimicrobial drug resistance.

Why is antimicrobial resistance a global concern?

The emergence and spread of drug-resistant pathogens that have acquired new resistance mechanisms, leading to antimicrobial resistance, continues to threaten our ability to treat common infections. Especially alarming is the rapid global spread of multi- and pan-resistant bacteria (also known as “superbugs”) that cause infections that are not treatable with existing antimicrobial medicines such as antibiotics.

The clinical pipeline of new antimicrobials is dry. In 2019 WHO identified 32 antibiotics in clinical development that address the WHO list of priority pathogens, of which only six were classified as innovative. Furthermore, a lack of access to quality antimicrobials remains a major issue. Antibiotic shortages are affecting countries of all levels of development and especially in health- care systems.

Antibiotics are becoming increasingly ineffective as drug-resistance spreads globally leading to more difficult to treat infections and death. New antibacterials are urgently needed – for example, to treat carbapenem-resistant gram-negative bacterial infections as identified in the WHO priority pathogen list. However, if people do

not change the way antibiotics are used now, these new antibiotics will suffer the same fate as the current ones and become ineffective.
The cost of AMR to national economies and their health systems is significant as it affects productivity of patients or their caretakers through prolonged hospital stays and the need for more expensive and intensive care.
Without effective tools for the prevention and adequate treatment of drug-resistant infections and improved access to existing and new quality-assured antimicrobials, the number of people for whom treatment is failing or who die of infections will increase. Medical procedures, such as surgery, including caesarean sections or hip replacements, cancer chemotherapy, and organ transplantation, will become more risky.

What accelerates the emergence and spread of antimicrobial resistance?

AMR occurs naturally over time, usually through genetic changes. Antimicrobial resistant organisms are found in people, animals, food, plants and the environment (in water, soil and air). They can spread from person to person or between people and animals, including from food of animal origin. The main drivers of antimicrobial resistance include the misuse and overuse of antimicrobials; lack of access to clean water, sanitation and hygiene (WASH) for both humans and animals; poor infection and disease prevention and control in health-care facilities and farms; poor access to quality, affordable medicines, vaccines and diagnostics; lack of awareness and knowledge; and lack of enforcement of legislation.

Need for coordinated action

AMR is a complex problem that requires a united multisectoral approach. The One Health approach brings together multiple sectors and stakeholders engaged in human, terrestrial and aquatic animal and plant health, food and feed production and the

environment to communicate and work together in the design and implementation of programmes, policies, legislation and research to attain better public health outcomes.

Greater innovation and investment is required in operational research, and in research and development of new antimicrobial medicines, vaccines, and diagnostic tools especially those targeting the critical gram-negative bacteria such as carbapenem-resistant Enterobacteriaceae and *Acinetobacter baumannii*. The launch of the Antimicrobial Resistance Multi Partner Trust Fund (AMR MPTF), the Global Antibiotic Research & Development Partnership (GARDP), AMR Action Fund and other funds and initiatives could fill a major funding gap. Various governments are piloting reimbursement models including Sweden, Germany, the USA and the United Kingdom. More initiatives are needed to find lasting solutions.

Global Action Plan on Antimicrobial Resistance (GAP)

Globally, countries committed to the framework set out in the Global Action Plan[1] (GAP) 2015 on AMR during the 2015 World Health Assembly and committed to the development and implementation of multisectoral national action plans. It was subsequently endorsed by the Governing Bodies of the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE). To ensure global progress, countries need to ensure costing and implementation of national action plans across sectors to ensure sustainable progress. Prior to the endorsement of the GAP in 2015, global efforts to contain AMR included the WHO global strategy for containment of Antimicrobial Resistance developed in 2001 which provides a framework of interventions to slow the emergence and reduce the spread of AMR.

Tripartite Joint Secretariat on Antimicrobial Resistance

The political declaration at the UN High Level Meeting on AMR, committed to by Heads of State at the United Nations General Assembly in New York in September 2016, confirmed a strong focus on a broad, coordinated approach that engages all including the human, animal, plant and environmental health sectors. WHO is working closely with FAO and OIE in a 'One Health approach to promote best practices to reduce the levels of AMR and slow its development.

The Interagency Coordination Group (IACG) on AMR was convened by the Secretary-General of the United Nations after the UN High-Level Meeting on Antimicrobial Resistance in 2016. The IACG brought together partners across the UN, international organizations and individuals with expertise across human, animal and plant health, as well as the food, animal feed, trade, development and environment sectors, to formulate a plan for the fight against antimicrobial resistance. The Interagency Coordination Group on AMR submitted its report " No time to wait: Securing the future from drug-resistant infections" to the UN Secretary-General in April 2019. Its recommendations are now being implemented.
A tripartite joint secretariat (FAO, OIE and WHO) has been established and is hosted by WHO to drive multi-stakeholder engagement in AMR. The key governance structures agreed include the One Health Global Leaders Group on AMR, the Independent Panel on Evidence for Action against AMR and the Multi-Stakeholder Partnership Platform. These structures are in the process of being established.

World Antimicrobial Awareness Week (WAAW)

WAAW was previously called the World Antibiotic Awareness Week. From 2020, it will be called the World Antimicrobial Awareness Week. This will reflect the broadened scope of WAAW to include all antimicrobials including antibiotics, antifungals, antiparasitics and antivirals. Held annually since 2015, WAAW is a global campaign that aims to raise awareness of antimicrobial resistance worldwide and encourage best practices among the general public, health workers and policy makers to slow the development and spread of drug-resistant infections. The Tripartite Executive Committee decided to set all future WAAW dates as 18 to 24 November, starting with WAAW 2020. The overarching slogan used for the last 5 years was "Antibiotics: Handle with Care." This has been changed to "Antimicrobials: Handle with Care" in 2020.

The Global Antimicrobial Resistance and Use Surveillance System (GLASS)

WHO launched the Global Antimicrobial Resistance and Use Surveillance System (GLASS) in 2015 to continue filling knowledge gaps and to inform strategies at all levels. GLASS has been conceived to progressively incorporate data from surveillance of

AMR in humans, surveillance of the use of antimicrobial medicines, AMR in the food chain and in the environment. GLASS provides a standardized approach to the collection, analysis, interpretation and sharing of data by countries, territories and areas, and monitors the status of existing and new national surveillance systems, with emphasis on representativeness and quality of data collection. Some WHO regions have established surveillance networks that provide technical support to countries and facilitate enrollment into GLASS.

Global Research and Development priority setting for AMR

In 2017, to guide research and development into new antimicrobials, diagnostics and vaccines, WHO developed the WHO priority pathogens list. It will be updated in 2022. On an annual basis, WHO reviews the pre-clinical and clinical antibacterial pipelines to see how the pipeline is progressing with respect to the WHO priority pathogens list. A critical gap remains in research and development, in particular for antibacterial targeting of the gram-negative carbapenem resistant bacteria.

Global Antibiotic Research and Development Partnership (GARDP)

A joint initiative of WHO and the Drugs for Neglected Diseases *Initiative* (DND*i*), GARDP encourages research and development through public-private partnerships. By 2025, the partnership aims to develop and deliver five new treatments that target drug-resistant bacteria identified by WHO as posing the greatest threat.

Refer to link.-
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi5rKPa6NDxAhV94HMBHQbLDo0QFjATegQIJBAD&url=https%3A%2F%2Fwww.who.int%2Fnews-room%2Fq-a-detail%2Fantimicrobial-resistance&usg=AOvVaw1TOlkydmYQUpdZkVaC6IZ8

Alternative approaches to antibiotics for targeting bacterial pathogens

For antibiotic uses that target a primary bacterial infection, there are numerous approaches to either reduce the selection for antibiotic resistance or to replace the antibiotic altogether. Each approach has its own benefits and costs, some of which were discussed recently and are further explored here. The most useful replacements for antibiotics are, like antibiotics, natural compounds or agents that inhibit bacteria. Among others, these include bacteriophages (phages), bacteriocins, and predatory bacteria. Unlike antibiotics, such alternatives can be targeted to specific bacteria, which is often desirable so as to avoid selecting for resistance of nontargeted bacteria

Phage therapy
Bacteriocins
Predatory bacteria

New Technologies in Vaccines

The discovery of vaccines has led to the near eradication of several important diseases and has had a tremendous impact on health for a relatively low cost. However, most vaccines in use today were developed by techniques that were pioneered more than 100 years ago and do not represent the full potential of the field. The introduction of genetic engineering has fueled rapid advances in vaccine technology and is now leading to the entry of new products in the marketplace.

In the past, options for the utilization of vaccines in the area of managed care had been quite limited because of the historically straightforward application of immunizations. The growing number and type of vaccine targets, coupled with novel, more effective formulations, adjuvants, and routes of delivery for vaccines, will undoubtedly create new challenges. Although progress in vaccine technology has the potential to prevent illness and reduce the economic burden of diseases in the long term, thereby improving outcomes, ongoing problems remain in the short term.

VACCINOLOGY: A RECENT HISTORY

Most vaccines in use today were developed by one of two classic methods. In the 19th century, Salmon and Smith pioneered the inactivation of an organism and the injection of immunogenic components.[4] The attenuation of live organisms, as first attempted by Louis Pasteur,[5] was adapted to modern vaccine technology by Enders et al. in the 1950s.[6] All but three vaccines in the currently recommended immunization schedule in the U.S.—those directed against hepatitis B virus, rotavirus, and HPV—are manufactured according to these techniques.

In the 1970s, a pair of key discoveries—the expression of proteins in plasmids and the ability to sequence DNA—ushered in the era of genetic engineering.[7,8] A decade later, in 1986, these techniques were used to develop the first *recombinant* vaccine, the hepatitis B vaccine.[9] Recombinant technology enables the target antigen to be produced outside the context of the parent organism, such that no live, infectious agents or potentially toxic components of those agents need to be handled. As a

result, the quantity of antigen produced, the vaccine′s safety, and the purity of the product are improved; efficacy is increased; costs are reduced; and potential side effects are minimized.

Since the advent of the hepatitis B vaccine in 1998, one recombinant vaccine, LYMErix, has been approved. Although LYMErix was effective against Lyme disease in adults,[10] GlaxoSmithKline (GSK) withdrew this product in 2002 because of declining sales and negative publicity.[11] This outcome has dampened enthusiasm for further development of human vaccines against Lyme disease, but it has not had an adverse impact on the prospects for creating a vaccine that uses a similar strategy of a recombinant protein against other infectious agents. Many other recombinant vaccines are currently being evaluated in clinical trials to determine their activity against such varied targets as malaria, hookworm, cytomegalovirus, parvovirus, and anthrax.[12]

The second major advance in the 1980s was in the area of *adjuvantation*. Adjuvants are used to improve the presentation of an antigen to the immune system or to enhance its immunogenicity. The only adjuvants currently approved in the U.S. for the concomitant use with vaccines are the mineral salts calcium phosphate and alum.[13] Mineral salts are still used in some inactivated vaccines, but their effectiveness is modest at best. For example, aluminum salts were included in early influenza vaccine formulations but were removed when the vaccines showed comparable immunogenicity in the absence of these salts.[14] In 1987, however, the application of conjugation as a method of adjuvantation led to the approval of a highly effective vaccine against *H. influenzae* type b, a leading cause of invasive infections, including meningitis, in children.[15]

Polysaccharide-based vaccines in general are poorly immunogenic, particularly in small children, because of a lack of T-cell help for the B-cell–dependent antibody response. Conjugating polysaccharides to a toxoid carrier converts these antigens from T-independent to T-dependent antigens, thus improving overall immunogenicity and lengthening the period of effectiveness.[16]

The success of this approach has led to the development of other polysaccharide conjugate vaccines, including Prevnar (Wyeth), a 7-valent pneumococcal conjugate vaccine approved in the U.S. in 2000, and Menactra (Sanofi-Pasteur), a quadrivalent meningococcal vaccine licensed in the U.S. in 2004. A vaccine directed against the serotypes of *Salmonella typhi*, which is responsible for typhoid fever, is now being studied.[12] The ongoing problem of suboptimal immunogenicity of protein-based

vaccines, coupled with the success of conjugation for polysaccharide-based vaccines, is driving a search for new vaccine adjuvants.

ADVANCES IN VACCINOLOGY

We predict that the development of virtually all vaccines licensed from this point forward will involve some form of genetic engineering. Entire viral genomes can now be cloned into bacterial or yeast vectors, allowing manipulation of genes prior to ″rescue,″ or regeneration of infectious organisms in culture. These techniques enable the rapid custom design of organisms for use in vaccines.

Influenza virus vaccines can serve as an example. The surface proteins from circulating strains can be cloned into plasmids and are co-expressed with a set of ″backbone″ genes responsible for high growth in eggs but attenuation in humans, allowing the production of safe, high-yield vaccines.[17] Undesirable traits, such as the multibasic cleavage site found in the main attachment protein of highly pathogenic avian influenza viruses, can be ″edited out″ at the DNA level before rescue of the virus, further enhancing safety.[18]

The use of plasmid-based methods also has the potential to hasten production of reassortant vaccines (i.e., vaccines from viruses created by combining genes from more than one organism or strain). The current process for making influenza vaccine relies on selecting appropriate vaccine strains from among many candidates generated by chance, whereas molecular methods allow complete control over the output, eliminating several steps in the generation of seed stocks.[17]

A variety of virus types, engineered by these methods to be safe in humans, are being used to express immunogenic foreign proteins outside of the context of the virulent parent organism. As an example, adenoviruses in which critical virulence genes are deleted have been used to express proteins from HIV[19] and are being utilized in clinical trials for many other pathogens such as the Ebola virus and malaria.[12]

It may be possible to create vaccine cocktails directed against several different pathogens by inserting multiple proteins into a single vector or by mixing several vaccines made with the same viral vector but expressing different proteins.[20] It is also possible to deliver the immunogenic proteins without using a replication-competent, live virus. Virus-like particles (VLPs) are self-assembling constructs that express a viral antigen, but they

do not contain the necessary material to replicate. This technology was used to develop Gardasil, Merck′s vaccine to protect against HPV, approved in 2006.

Refer Link
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2730064/

The Future of Artificial Intelligence and Medicine

Medical professionals are quick to note that AI-backed technologies strive to free them from time-consuming, monotonous work and are not meant to supplant the skills and empathy of humans. They hope this diagnostic technology will complement and enhance their work.
Some doctors warn AI could create two classes of medical care, where some patients still seek the care of human professionals while others will accept the diagnosis offered by an algorithm. But as with other industries that are slowly implementing AI technologies, the medical professional will undoubtedly balance time-honored practices that rely on human experience with the best the technology has to offer.

For more on AI and Medicine-
https://www.datarevenue.com/en-blog/artificial-intelligence-in-medicine