Bangladesh AMR Newsletter

HANDLE ANTIMICROBIALS WITH CARE

Antibiotics
Antivirals
Antifungals
Antiparasitics

PREVENTING ANTIMICROBIAL RESISTANCE TOGETHER

Celebration of World Antimicrobial Awareness Week (WAAW) 2023

Advocacy meeting on Antimicrobial Resistance Containment organized by CDC

Communicable Disease Control (CDC), Director General of Health Services (DGHS) organized an advocacy meeting on Antimicrobial Resistance Containment in Hotel Intercontinental, Dhaka on 20 November 2023 as a part of celebration of World Antimicrobial Awareness Week (WAAW) 2023. Mr. Md. Jahangir Alam, Honorable Secretary of Health Service Division, Ministry of Health and Family Welfare was present as the chief guest and the meeting was presided by Prof. Dr Abul Bashar Mohammad Khurshid Alam, Honorable Director General, Directorate General of Health Services. Major General Mohammad Yousuf, DG, DGDA, Mr. Khandaker Mahbubul Haque, DG, Department of Fisheries, Dr Md. Emdadul Haque Talukder, DG, Department of Livestock Services were present as special guests. Short presentations were given by designated people from different sectors followed by brief discussions by the guests. As a part of celebration of WAAW, Divisional health offices, District health offices and District hospitals and Upazilla health complexes organized rallies and advocacy meetings with different stakeholders on AMR awareness.

Mr. Md. Jahangir Alam, Secretary, Health Service Division, MoHFW is addressing AMR issue in the advocacy meeting organized by CDC

Editorial

The National Antimicrobial Resistance Containment programme of Bangladesh (NARC) is marking end of another remarkable year 2023. We have been able to establish a surveillance system capable of producing quality AMR data from the designated surveillance sites representing animal and human health sectors and aqua culture. The expansion of surveillance network to private sector continued in 2023 and steps have been taken to include leading laboratories in animal health sector as reporting units in near future. The availability of quality surveillance data provides the basis for data driven action for prudent choice of antimicrobials by the practitioners and for further investment in NARC by the policymakers.

In 2024, our plan is to further expand and intensify the AMR and AMU surveillance with increase in number of surveillance sites to promote divisional representativeness of data. At the same time, we are planning to initiate environmental surveillance for AMR which, I believe, will provide a comprehensive picture of AMR status in the country. Emphasis will be given to enhancing data quality and increasing data usage, along with intensification of surveillance through introduction of the WHO “Tricycle surveillance protocol for ESBL-producing E.coli”, building country capacity for genomic surveillance, and several other approaches.

NARC is thankful to all development partners in AMR surveillance and containment for their contribution. While we are highly committed to building a strong sustainable programme, we recognise the need of further support. I am glad that Fleming Fund Country Grant to Bangladesh has successfully completed its' Phase I and that its' Phase II will commence soon. I wish all the stakeholders and partners of NARC a happy and productive New Year.

Prof Dr Md. Nazmul Islam
Chief Editor, Director, Disease Control and Line Director, CDC

Rally and One Health Seminar organized by the Department of Livestock Services (DLS)

The Department of Livestock Services (DLS) in collaboration with World Organization for Animal Health (WOAH) celebrated World AMR Awareness Week (WAAW) on 23 November 2023 with the theme "Preventing Antimicrobial Resistance Together". To mark this auspicious occasion, a colorful rally followed by a One Health seminar was organized at the auditorium of the Bangladesh Agricultural Research Council, Farmgate, Dhaka. Mr. S M Rezaul Karim, MP, Honorable Minister, Ministry of Fisheries and Livestock was present as the chief guest. Dr Mohammad Reajul Huq, Director, Administration, DLS; Prof. Dr Tahmina Shirin, Director, IEDCR; Prof. Dr Nitish C Debnath, Team Lead, Fleming Fund Country Grant; Dr Eric Brum, Country Team Lead, FAO-ECTAD; Dr Md. Rafiqul Islam, Senior Consultant, FAO-ECTAD and Dr Md. Nure Alam Siddiky, National AMR Consultant, WOAH were present as the special guests. Dr Md. Emdadul Haque Talukder, Director General, DLS chaired the seminar. In the seminar, two thematic papers were presented from human and animal health sectors by the two experts, Dr Md. Aninda Rahman, Deputy Program Manager, CDC, DGHS and Dr Md. Abu Sufian, Director, DLS respectively. Honorable minister highly appreciated the timely initiatives for awareness raising among the stakeholders on the occasion of WAAW. He stressed the devastating impact of AMR in human and animal health. He urged shared responsibilities and collective efforts among the national and development partners to tackle the impact of AMR in human, animal and environment interface in a One Health approach. He reiterated the commitment of the ministry of Fisheries and Livestock in the AMR containment endeavor. During the seminar appreciation letter along with memento were distributed to the winners who took part in the WAAW essay competition. The seminar was attended by the 250 participants from the human, animal and aquatic sectors including development partners. Similarly, WAAW was also celebrated in the eight divisions of DLS in a One Health approach. Furthermore, two communication materials (poster and leaflet) were developed and distributed across the country to raise public awareness.

Rally at DLS on WAAW 2023

Mr. S M Rezaul Karim, MP, Honorable Minister, Ministry of Fisheries and Livestock is delivering his speech in the seminar organized by DLS

Celebration of WAAW 2023 by IEDCR with Surveillance Sites

As the sectoral coordination center for antimicrobial resistance (AMR) surveillance in human health, the Institute of Epidemiology, Disease Control and Research (IEDCR) celebrates WAAW 2023 with a well-suited and engaging approach at all eleven of its sentinel sites as well as centrally at IEDCR, contributing to the ongoing efforts to enhance awareness and understanding of AMR. An array of academic competitions, including essay writing, video content production, art and quiz contests, were conducted for students at the Higher Secondary Certificate (HSC) level and above. The events extended to encompass participants from both public and private medical colleges, as well as institutions specializing in Dental medicine, Homeopathy, Unani & Ayurvedic, Medical Assistant Training School (MATS) and Institute of Health Technology (IHT). Notably, this edition of competitions welcomed the active participation of doctors and other professionals in the essay competition. In a concerted effort to raise awareness among healthcare professionals at sentinel sites and the public, various activities such as poster exhibitions, banners, rallies, and leaflet distributions were meticulously organized. It is noteworthy that all the visual materials, including posters and leaflets, were crafted using the carefully selected artworks and essays submitted by the students. IEDCR also prepared a festoon for all the surveillance sites highlighting the surveillance activities and findings. Within the sentinel sites, programs were arranged for site

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dissemination, presenting the latest surveillance data, their own antibiograms and facilitating discussions on awareness issues among doctors and medical students. IEDCR conducted training sessions in three batches to enhance capacity for preparing antibiograms. Additionally, they offered data analyst support to assist in the antibiogram preparation for all sentinel sites. As a result of these efforts, this year, all sentinel sites successfully created their own antibiograms. Extending beyond the eleven sentinel sites, the posters and leaflets were also shared with prominent stakeholders, including the Communicable Disease Control (CDC), Directorate General of Health Services (DGHS), National Institute of Cancer Research and Hospital, and Sheikh Hasina Medical College Hospital in Tangail. Other than the sentinel sites, IEDCR also assisted in organizing a seminar for students at Sheikh Hasina Medical College in Tangail to enhance awareness among the student community. A "Dissemination Program on National Antimicrobial Resistance (AMR) Surveillance" was centrally organized by IEDCR, featuring Md. Jahangir Alam, Secretary of Health Services Division, MoHFW, as the chief guest. The event also had the participation of the Director General of Directorate General of Health Service (DGHS) & Directorate General of Medical Education (DGME), Addl. Director Generals of DGHS, Director of National Institute of Preventive and Social Medicine (NIPSOM), and representatives from developmental partners as special guests. The audience comprised representatives from various stakeholders, including clinical societies, microbiology societies, animal health, fisheries, environment, nongovernmental organizations working with AMR, and medical journalists. A significant highlight of the event was the unveiling of the "Report on National Antimicrobial Resistant Surveillance, Bangladesh, 2016-2023." The chief guest, along with other esteemed attendees, officially revealed the report, marking the inaugural publication of findings from this surveillance initiative. The report encompasses insights from both global and national perspectives, details about participating laboratories, crucial findings derived from surveillance data, and trends in resistance patterns. The event showcased not only the presentation of current human health surveillance data but also on research related to layer poultry farms and the environmental interface. IEDCR also arranged a poster exhibition, awarded prizes to competition winners, and organized a rally as part of the program. Leading newspapers and television media covered the event hosted by IEDCR.

Rally at IEDCR

Dissemination program on national AMR surveillance in Bangladesh

Md. Jahangir Alam, Secretary of Health Services Division, MoHFW is inaugurating the poster exhibition at IEDCR

AMR Advocacy and Awareness campaign on World AMR Awareness Week 2023 by DGDA

AMR Advocacy Workshops on WAAW 2023 in DGDA

DGDA, with WHO support, hosted an AMR advocacy campaign during World AMR Awareness Week 2023 at DGDA, chaired by Major General Mohammad Yousuf. The event, featuring the AMR Animation "Tinu Minu and Super Bug," focused on youth education. Major highlights included DGDA AMR cell activities, the new "Drug and Cosmetics Act 2023," and a pledge from Mr. Md. Khalid Shifullah for AMR curriculum inclusion in secondary schools.

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Representatives from animal health, academic institutions, and health organizations, including Prof. Md. Sayedur Rahman, Prof. Dr. Meerjady Sabrina Flora, Prof. Dr. Tahmina Shirin, Prof. Dr. Md. Nazmul Islam, and Prof. Sitesh Chandra Bachar, provided insights. The Embassy of Sweden, development partners like Flemming Fund, World Organization for Animal Health, USAID-MTaPS, Better Health Bangladesh, and USP-PQM+ shared perspectives. Prof. Dr. Md. Ismail Khan, Vice Chancellor of Chittagong Medical University, gave closing remarks, expressing gratitude to all participants.

WAAW 2023 Celebration in DGDA HQ Dhaka

AMR Advocacy Workshops on WAAW 2023 at Divisional Level

DGDA also organized 7 AMR advocacy workshops and rallies during WAAW 2023, in various divisions. Representatives from diverse organizations attended. Materials like posters, presentations, and attire were distributed to raise awareness. Post-rally discussions covered AMR info and the new "Drug and Cosmetics Act 2023" (Section 40(d)), enforcing fines up to 20,000 BDT for selling antibiotics without a prescription, crucial for responsible use and prevention of misuse.

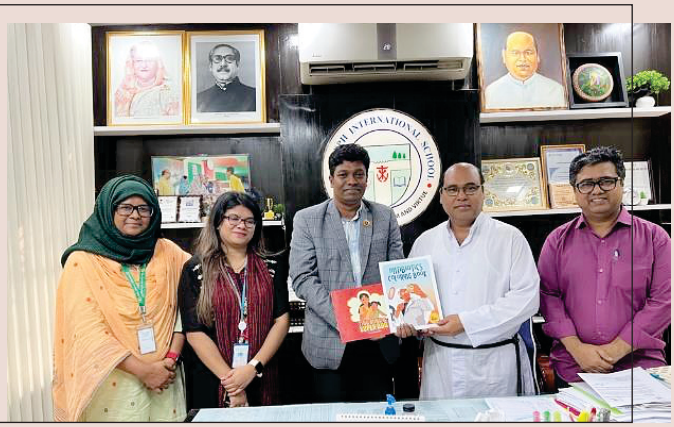
Engaging TV media to create mass awareness on AMR

DGDA has taken steps to create a more effective approach by introducing an animated version of "Tinu-Minu and Super Bug," accompanied by a theme song. This initiative was inaugurated during the World AMR Awareness Week in 2023. This animation was broadcasted in 3 national TV channels of Bangladesh:

Channel I, Independent TV and Duronto TV with the technical and financial support from WHO.

Dissemination of AMR Educational materials in various schools in Bangladesh

DGDA, with WHO support, is creating awareness materials for schoolchildren. The Directorate of Secondary and Higher Education (DSHE) Bangladesh has granted permission for DGDA to distribute AMR awareness materials, including "Tinu-Minu & Super Bug," "Invention of Penicillin," and comics posters, to all secondary schools. DGDA aims to distribute these materials to all secondary schools. With DSHE permission, DGDA and WHO started disseminating awareness materials in 12 schools in Dhaka.



Celebration of One Health Day 2023

One Health Bangladesh and One Health Secretariat jointly celebrated International One Health Day 2023 on 5th of November 2023 engaging professional, academia, government, and development partners. Theme of this year's event is - "Connecting Air, Land, and Water," highlights the importance of One Health collaboration to solve complex challenges that span local, regional, and international landscapes. The committee organized **World One Health Day Extempore Speech Competition 2023** among university students through online platform and conducted in-person **celebration program** at the Auditorium, Forest Department, Bon Bhaban, Agargaon, Dhaka. Mr. Md. Jahangir Alam, Secretary, Health Services Division, Ministry of Health and Family Welfare, was the esteemed Chief Guest of the program, and Dr. Farhina Ahmed, Secretary, Ministry of Environment, Forest, and Climate Change, presided over the session. Prof Nitish Chandra Debnath, National Coordinator, One Health Bangladesh inaugurated the program by welcoming all the participants and delivered the keynote presentation on "One Health Program in Bangladesh and One Health Day".

Mr. Md. Jahangir Alam, Secretary, Health Services Division, MoHFW is delivering his speech in the celebration program of One health Day 2023

Dr Farhina Ahmed, Secretary, Ministry of Environment, Forest, and Climate Change is presiding over the session of the celebration program of One Health Day 2023

CDC Organized Workshop to Finalize the National Antimicrobial Stewardship (AMS) Guidelines for Healthcare Facilities

Antimicrobial resistance (AMR) is a silent pandemic. Scientists predict that, besides the morbidity consequences, the world will face more than 300 million deaths and $100 trillion economic losses between now and 2050, if no action is taken. Consequently, more than 24 million people in low- and middle-income countries will be forced into extreme poverty. In 2019, AMR cost 389,000 lives in South Asia, 84,000 of which were children under 5. In the same year, 1.27 million deaths were caused by AMR worldwide.

The World Health Organization (WHO) is considering the AMR issue as one of the top ten public health threats and recommended the national action plan (NAP) including antimicrobial stewardship (AMS). Government of Bangladesh has developed a costed NAP by the technical assistance by USAID MTaPS program in Bangladesh. Misuse and overuse of antimicrobials including antibiotics in human, animal and food commodities, inadequate water, sanitation, and hygiene (WASH) practices; and inadequate infection prevention and control (IPC) efforts particularly at the facility level are the major factors for developing or spreading resistant pathogens. Both IPC and AMS at the healthcare facilities play important role in preventing AMR and may be implemented together in synergy for better outcome.

The Communicable Disease Control (CDC), DGHS organized a workshop on Finalization of National Antimicrobial Stewardship (AMS) Guidelines for Healthcare facilities on 14-15 October 2023. Around 35 participants consisting of Directors and Assistant Directors of DGHS, Microbiologists, UHFPO, Surveillance experts from IEDCR, Clinicians and MIS, DGDA and QIS officials attended to finalize the guideline. WHO Bangladesh provided the technical

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assistance. The basic concept of AMS was presented and contents of the drafted AMS national guideline including conducting and monitoring of AMC and PPS surveys, usage of authorization forms, prescription auditing forms etc. Use of available diagnostic services and of national AMR data, especially the antibiograms to guide rational use of antimicrobials was highlighted in the discussions.

Workshop to Finalize the National Antimicrobial Stewardship (AMS) Guidelines for Healthcare Facilities

National Infection, Prevention and Control (IPC) Committee Formed in the Core Working Group (CWG) Meeting

Quarterly meeting of the Core Working Group (CWG) of the National AMR Containment Program was held at the Communicable Disease Control (CDC) conference room of DGHS on 7 August 2023, where the main objective of the meeting was to discuss Antimicrobial Stewardship in the light of Infection Prevention and Control (IPC). Development of IPC Guideline, training on IPC, establishment of IPC committee and IPC Surveillance were recognized as the most important components of the meeting. Activity on IPC started in 2020 and 'Quality Improvement Secretariat' (QIS) of health ministry also did some works on IPC. In January 2020 IPC guideline were developed based on AMR concept by embracing all relevant disciplines, such as Microbiologists, Virologists, Clinicians, Public Health Specialists, Infection Prevention Specialist etc. Regular updating of the guideline has been completed, and the present guideline is the third edition, which contains figures, illustrations and pictures that has made it more user friendly in the hospital settings. Training modules also contain illustrations, and videos etc. 'Community Based Heath Centers' (CBHC) also developed another guideline on IPC with support from 'National Antimicrobial Resistance Containment' (NARC).

A purposive survey on IPC status was conducted in 2020 and repeated in 2021 and 2023 by 'The medicines, Technologies and Pharmaceutical Services' (MTaPS). The results of the survey in 2020 and 2021 are summarized below (results of 2023 still pending):

Core Working Group (CWG) meeting at DGHS

purposive survey on IPC status was conducted in 2020 and repeated in 2021 and 2023 by 'The medicines, Technologies and Pharmaceutical Services' (MTaPS). The results of the survey in 2020 and 2021 are summarized below (results of 2023 still pending):

Activities/Services	In 2020	In 2022
IPC committee in the hospital	54%	96%
Guideline retained in the hospital	74%	92%
Hand washing Facilities	85%	91%
Trained Personnel	18%	80%

Finally, a 'National Committee for Infection Prevention & Control' was formed with the Additional Director General (Planning & Development), DGHS as its' chair. The committee has wide representation by members of relevant departments and partner organisations. A National IPC plan has been drafted by the technical assistance of USAID MTaPs. The national IPC committee will develop and implement IPC plan & policy, monitor and evaluate the IPC activities in the facility level along with coordinate with stakeholders.

Establishing Antimicrobial Stewardship (AMS) Units at the Veterinary Educational Institutions

The Department of Livestock Services (DLS), in collaboration with Fleming Fund Country Grant to Bangladesh (FFCGB), organized a discussion meeting with the academicians from the veterinary educational institutions for establishing antimicrobial stewardship (AMS) units at the institutes. Chaired by Dr. Md. Reajul Huq, Director (Admin), DLS the meeting was held on 26 September 2023 in the conference room of DLS. The meeting was attended by the Veterinary Faculty Deans from the different universities and the Principals from the Government Veterinary Colleges. Members of the Sectoral Working Group (SWG) for AMR surveillance in Animal Health sector also attended the meeting.

Following aspect were discussed in the meeting:

- Formation of AMS units at institutional level
- Selection of AMS focal points for the respective institutes
- Sharing of antimicrobial resistance (AMR), antimicrobial use (AMU) and antimicrobial consumption (AMC) related research findings/data with DLS using BAHIS platform
- Developing university teaching veterinary hospitals as model for AMR surveillance

After a thorough discussion on the aspects mentioned above, it was recommended that

- AMS units will be formed at each of the veterinary institutions
- For better coordination, existing SWG members from the respective institutions will be the focal points for the AMS units
- Thesis and journal papers on AMR/AMU/AMC will be shared with DLS using BAHIS platform; DLS will share the links (with passwords) of the BAHIS AMR dashboard with the veterinary universities and colleges for uploading research findings/data
- DLS will arrange demonstration/training for the selected focal points on data entry into the BAHIS with support from FFCGB.
- Deans/AMS focal points will take care of informing other relevant faculty members about the committee and request them to submit their research findings/data into the BAHIS
- Veterinary Faculty Deans with the leadership of AMS unit will take necessary measures for developing university teaching veterinary hospitals as a model for AMR surveillance.

U.K. Government Officials Visited Bangladesh

Officials from the U.K. Department of Health and Social Care (DHSC) visited Bangladesh to gain insight into the antimicrobial resistance (AMR) landscape, to review the achievements of the Fleming Fund Country Grant to Bangladesh, the lessons learnt during its' implementation, to explore the scopes and the modalities to consider for planning of the project's second phase (2024-2025). DHSC officials met with government stakeholders, the Fleming Fund Country Grant team, development partners and visited two National Reference Laboratories (pictured below). The DHSC team expressed their satisfaction on the progress of implementation of the current phase of FFCGB in establishing AMR surveillance capacity in the country. The visitors highly appreciated the transformation of the laboratories visited, into modern state-of-art facilities.

Visiting Human Health NRL- IEDCR

Visiting Animal Health NRL- CDIL

Dissemination of AMR School Campaign Findings for Informed Policy Decision-making in Dhaka

DGDA, with WHO's support, organized a roundtable chaired by Major General Mohammad Yousuf, DG-DGDA, addressing antimicrobial resistance (AMR) on 29.10.2023. A school-level AMR awareness program at Chattogram Cantonment Public College included an experimental study, "Assessing the Impact of AMR Awareness Interventions Among School Children in Bangladesh." The study emphasized the need for widespread awareness among individuals and communities. Representatives from various organizations, including CDC-DGHS, NIPSOM, IEDCR, Chittagong Medical University, BSMMU, and others, were present. The meeting stressed the importance of incorporating AMR issues into the secondary educational curriculum, with all participants, including MOHFW, showing a good understanding. Following the roundtable, on December 13, 2023, MOHFW officially requested NCTB to include AMR issues in the secondary educational curriculum.

Round Table meeting on the Incorporation of AMR Issues in the Secondary School Curriculum

The DGDA AMC Cell Organized Four Training Programs Aimed at Enhancing AMC Surveillance in Bangladesh

DGDA established AMC Surveillance in Bangladesh, reporting to WHO-GLASS. Collaborating with WHO, DGDA organized four training phases in Jan and July. These aimed to assist pharma reps in AMC Surveillance, vital due to lessons from 2022 data collection. Pharmaceutical companies needed training to submit data accurately; non-compliance led to DGDA follow-ups. Accurate data is vital for WHO's GLASS-AMC portal and informed policies. Workshops educated on data format, reducing communication issues in 2023 data submissions, proving training's effectiveness.

Meeting on AMC/AMU Surveillance in Bangladesh through consultative workshops with pharmaceutical company and DGDA officials.

Meeting of Taskforce for AMC to Monitor Antimicrobial Consumption/Use in Bangladesh

On September 3, 2023, a Taskforce monitored Antimicrobial Consumption/Use (AMC/U) in Bangladesh. Members provided feedback on the National Guideline for Antimicrobial Drug Management, discussed the SOP for Veterinary AMC Surveillance, reviewed the 2021 AMC surveillance report, and examined awareness materials for World AMR Awareness Week (WAAW) 2023 in collaboration with WHO Bangladesh.

The Director General of DGDA chaired the meeting, addressing concerns about drug dispensing and disposal.

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Key stakeholders, including CDC, IEDCR, DLS, BLRI, BSMMU, DOF, FAO, USAID, USP-PQM+, BHB, Fleming Fund Bangladesh Country Grant and WHO Bangladesh, were present. WHO recommended incineration guidelines.

Taskforce members provided insights into interpreting AMC surveillance data, revealing increased national antimicrobial consumption during the COVID-19 pandemic, highlighting misuse. The meeting concluded with a request for a comprehensive data analysis later.

Meeting of Taskforce for AMC to monitor antimicrobial consumption/use in Bangladesh

Stakeholder consultation meeting to develop SOP for AMC/U for veterinary medicine in Bangladesh

Three meetings on July 25th, 26th, and 27th, 2023, included stakeholders like BLRI, DLS, Department of Fisheries, Fleming Fund, BHB, UN FAO, WHO, and DGDA officials. Their main goal was to create Standard Operating Procedures (SOP) for veterinary medicine surveillance related to Antimicrobial Consumption (AMC). After extensive discussions, a comprehensive SOP with a methodology was developed.

However, a significant challenge was noticed: determining the denominator population correction unit (PCU) specific to Bangladesh. Precise data on the "Average weight at the time of treatment (Aw)" in kilograms for various livestock and poultry species (chicken, duck, cattle, buffalo, sheep, and goat) is lacking. To address this, DGDA formally requested the Department of Livestock Services to conduct a comprehensive survey to determine the "Average weight at the time of treatment (Aw)" in kilograms for these animals.

While awaiting this data, DGDA plans to initiate a pilot surveillance program using available European and Thai data. Once the necessary data is collected and verified, DGDA will create comprehensive guidelines for veterinary medicine AMC monitoring, utilizing insights gained from the pilot study.

Stakeholder consultation meeting to develop SOP for AMC/U for veterinary medicine in Bangladesh

One Health training and workshop on Adaptation of AMR Control with Bangladesh AMR Response Alliance (BARA) at Jakarta, Indonesia

FAO Bangladesh ECTAD collaborated with FAO Indonesia ECTAD with a simultaneous One Health training and workshop on Adaptation of AMR Control with Bangladesh AMR Response Alliance (BARA) at Jakarta, Indonesia during 23 May-26 May 2023. The training and workshop came up with the idea of adapting BARA approach for Indonesia team as well which was developed in Bangladesh.

The BARA OH AMU guidelines developed by Bangladesh provides comprehensive details on infectious pathogens and corresponding effective antimicrobials following WHO AWaRe categorization. The guidelines have been updated based on recent antibiograms and then upgraded into a mobile phone app that is easier to be used by the trained clinicians and veterinarians for empirical diagnosis and treatment. The Indonesian BARA members from different sectors committed to use BARA approach for implementing national antimicrobial stewardship programs.

BARA trainers from animal health and human health along with ECTAD Bangladesh country team leader facilitated the workshop. FAOR Indonesia Rajendra Aryal appreciated the joint venture.

BARA team members with FAO Indonesia team along with Govt

U2C II/BARA poultry farmers intro training for model farm on AMR/AMU

Three Day U2C II/BARA poultry farmers intro training for model farm on AMR/AMU was held on 23-25 August 2023 in Khulna facilitated by FAO and funded by Fleming Fund UK and USAID to support for ensuring the responsible use of antimicrobials in poultry farms which has been identified as a core activity of ECTAD Bangladesh.

Following BARA AMR/AMU training modules and U2C II model farmers training module, a small group of experienced U2C and BARA veterinary trainers from both DLS and private sector along with FAO technical advisors identified key wrong behaviours of farmers and designed the training program to establish model farm ensuring responsible AMU.

Farm visit during U2C II/BARA Intro farmers Training for model farm

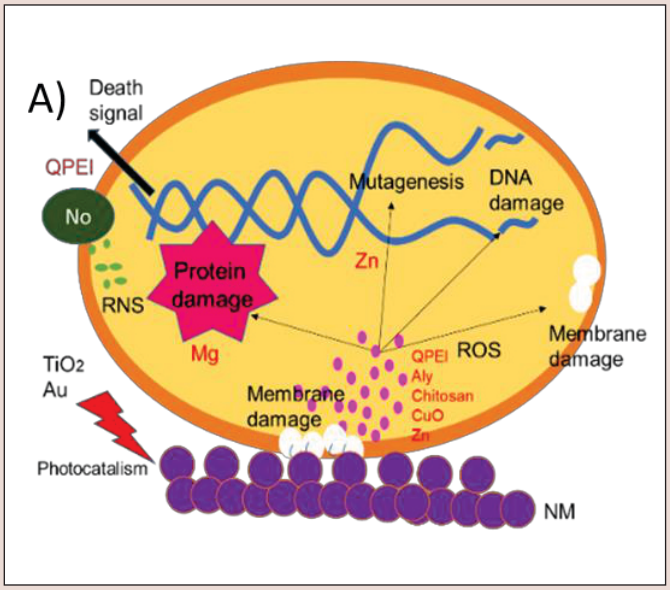
Three-day CPD expansion training on AMU/AMR for professionals

FAO conducted another batch of the "Three-day CPD expansion training on AMU/AMR for professionals" on 26-28 August 2023 in Khulna funded by Fleming Fund UK. This training program is designed for capacity building and sensitization packages on responsible antimicrobial usages (AMU) as a part of Continuing Professional Development (CPD) for Bangladeshi human and animal health professionals. Human and animal health practitioners sensitized and motivated to the prudent and responsible use of antibiotics following WHO AWaRe categorization and standard treatment guidelines (STGs) developed for Bangladesh. 10 participants from human health and 10 from animal health professionals from different government and private institutions attended this training program.

Facilitators holding the WHO Aware categorization posters.

Nanoparticles as an alternative to Antibiotics

Indiscriminate use of antimicrobials in food animals is considered to be one of the major factors of development of antimicrobial resistance (AMR) in the bacterial population circulating in the environment which in turn is posing threat to the public health. If this environmental exposure of resistant microflora is allowed to continue, one day might come when majority of available antimicrobials will fail to resist subsequent infection and consequently, the patients will die of ordinary septicemia. Under this situation, exploration of new antimicrobial agents is an essential approach as a preparedness for the forth coming post-antibiotic era. Development of high functional antimicrobial nanomaterials (NM) could be an ideal approach for overcoming such bacterial resistance. Owing to their small sizes and higher surface-to-volume ratio, nanoparticles (NPs) offer huge contact area with a microorganism. Due to this feature, NPs possess enhanced biological, chemical and physical activity, and therefore, antimicrobial nanoparticles offer higher antibacterial activity. Another important property of nanoparticles is their ability to target multiple bacterial structures, such as disruption of cell membranes, increases permeability, protein/DNA damages, programmed cell death, photocatalism, etc. as shown in Figure1A. Unlike antibiotic, such mechanism of action of a NM cannot be prevented by resistance phenomenon of bacteria. In the recent years, many nanoparticles have been utilized as alternative of antimicrobial drugs to enhance therapeutic effectiveness. However, the exact mechanisms of the nanomaterials based bacterial inhibition needs further experimental validations.



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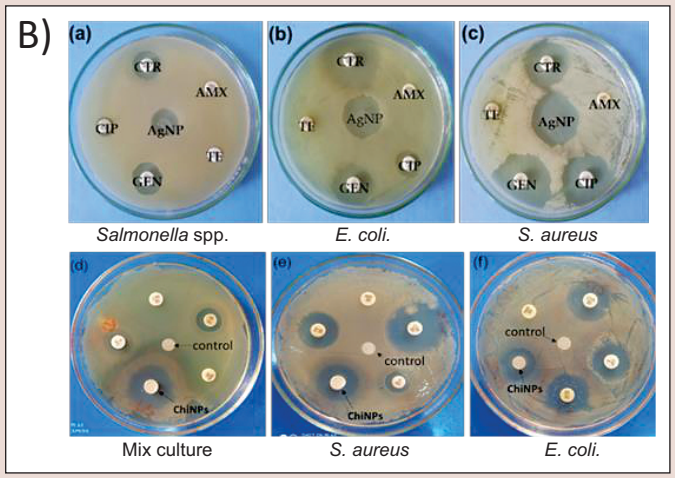

Fig.1. A) Mode of action of Nanomaterials (NM) as alternative of antibacterial drugs, B) Antibacterial effects of Silver Nanoparticles (AgNPs) against a) *Salmonella spp.,* b) *E. coli*, c) *S. aureus* and Chitosan Nanoparticles (ChiNPs) against d) mixed culture, e) *S. aureus,* and f) *E. coli*

In Bangladesh, a recent antibacterial investigation using Silver Nanoparticles (AgNPs) and Chitosan Nanoparticles (ChiNPs) showed excellent performances against some commonly available poultry bacteria (Figure 1B). For this, the antibiogram profiling was employed using standard disk diffusion method where the zone of inhibition was used as a parameter for evaluating the sensitivity.The antibacterial activity of AgNPs against *Salmonella* spp. (Fig.1Ba), *E. coli* (Fig.1Bb), and *Staphylococcus aureus* (Fig.1Bc) was found to be comparable with the commercial antibiotic disks. It is thought that positively charged surface, ligand replacement ability and oxidative dissolution capabilities of AgNPs facilitated their binding to the negatively charged surface of bacteria resulting in enhanced bactericidal effect. The antibacterial activity of ChiNPs was also compared with the commercial antibiotic disks where, ChiNPs were found effective against *S. aureus* (Figure 1Be) and *E. coli* (Figure 1Bf) separately as well as against their mixed culture (Figure 1Bd) but, all commercial antibiotic disks were found ineffective against mixed culture (Figure 1Bd).

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