

Antimicrobial Resistance (AMR) and their Implications in Human and Animal Health

HM Salim^{1*}, ABM Khaleduzzaman and MAH Beg²

¹Department of Livestock Services, Khamar Bari, Dhaka, Bangladesh

²Department of Poultry Science, Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagor, Dhaka, Bangladesh

*Corresponding Author: HM Salim, Department of Livestock Services, Khamar Bari, Dhaka, Bangladesh.

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The use of antibiotics in food animals for growth promotion and disease prevention may cause antibiotic resistance in humans and animals, resulting in treatment failure when needed (Figure 1). These problems are also increasing due to the misuse of antibiotics as growth promoters in animal feeds as well as the treatment of humans and animals. In addition, withdrawal period are not maintaining when antibiotic used for disease treatment of animals may cause residual effect on food chain and environment (Figure 2). Evidence shows that antibiotic resistant genes can be transmitted from animal to human micro biota. As a result, every year there is a huge economic loss due to the medical cost of less effective antibiotics for human health. Very recently, a report from the European Union (EU) indicated that about twenty five thousand patient died each year from infections by drug resistant bacteria, which is equivalent to €1.5 billion of hospital cost. This report indicates the seriousness of the problem throughout the globe. In case of Bangladesh, these Antimicrobial Resistance (AMR) effect is more alarming due to serious misuse of antibiotics in humans as well as in animals. As a consequence of public health safety concern, several countries including Bangladesh have banned or restricted the use of human health related antibiotics in food animal production.

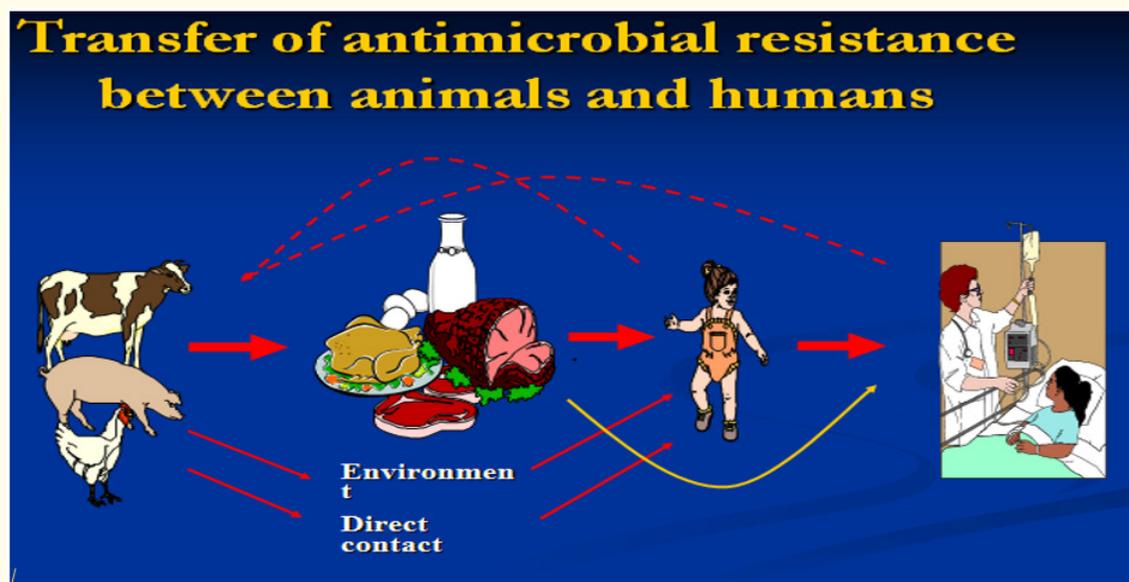


Figure 1: Transformation of AMR between animals and humans [1].

Very recently, to combat these problems, a Bi-regional Technical Consultation on Antimicrobial Resistance (AMR) in Asia held on 14 - 15 April 2016 was organized by WHO in Tokyo, Japan. Fortunately, I had a chance to attend in this meeting with my other Bangladeshi Fellow colleagues. So, I have keen interest to make a report on this AMR issues on the basis of the meeting experience and my previous postdoctoral research experience in the University of Manitoba, Canada. I do believe, it is a high time to control antibiotic uses in humans as well as in animals to make a healthy nation in Bangladesh.

Name of the country attended in the meeting

Australia, Bangladesh, China, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Korea, Thailand and Vietnam. In addition, several international organizations, university professors and expert members were also present in the technical consultation meeting.

Feed legislation and quality control in relation to AMR: Bangladesh experiences

The Fish Feed and Animal Feed Act 2010 in Bangladesh consists of 24 rules in which regulations for the use of antibiotics, hormones and chemicals that may affect the animals and humans are described in rule 14. The Fish and Animal Feed Act 2010 describes provisions regarding enforcement authority, investigation, arrest, search and seizure, designate laboratories, legal proceedings of officers from prosecutions, jurisdiction etc. Empowerments to enforce the Feed Act are regulated by authorized officers designated by the Director General, Department of Livestock Services (DLS) and the regulations made to carry into effect the provisions in the Act. The main purpose of quality control program is to ensure the nutritional specification, identification of adulterants presence in feeds, maintaining legislative issues, to minimize the cost of rework scrap, product recalls, warranty and product liability suits and to improve product reliability and provide greater satisfaction on the consumers in relation to AMR. The activities have been performed by the DLS (July/2018-April/2019) under the quality control program are illustrated in following table 1.

Sl No	Activities	July/2018 - April/2019
1	Conducting mobile court in the feed mills	138
2	Total amount of seized feeds (MTs)	1,00,087
3	Destruction of adulterated feeds (MTs)	1,01,711
4	Court file against feed manufacturer (Nos)	14
5	Collection of money by mobile court (BDT)	1,70,84,500
6	Total no. of registered feed mill (Cumulative)	209
7	Total no. of inspected feed mill	2184
8	No. of animal feeds tested in central and regional laboratories	485

Table 1: Implementation of the Fish Feed and Animal Feed Act 2010 at field level of DLS.

Discussion and our contribution in the technical meeting

The technical consultation meeting focused on moving forward with comprehensive policies and actions to implement national action plans on AMR appropriate to each country context and opportunities for strengthened regional collaboration. In the discussion, we raised our voice for global restriction of antimicrobial use in animal feeds and we mentioned that several effective alternatives such as probiotic, prebiotic, organic acid, enzymes, trace minerals and herbal products are available in the market in replacement of antibiotics. We also mentioned that Bangladesh is the second country in Asia followed by Korea where imposed a complete ban on antibiotic use in food animal production. Most of the members of the meeting appreciated Bangladesh for this decision and adopted one of our proposal in the final recommendation of the technical consultation meeting are as follows.

Promoting awareness and advocacy

Accelerate advocacy for a whole-of-government political commitment to ensure sustained efforts are maintained to contain AMR at the local, national, regional and global levels:

- Organize ongoing public campaigns to increase awareness and change behavior on sanitation, hygiene, infection prevention and control practices, and the responsible use of antimicrobials;
- Hold annual antibiotic awareness week campaign activities in all countries to deliver messages that address the challenges across the human, animal and agricultural sectors;
- Mandate inclusion of AMR stewardship into education programmes for personnel working in human and animal health, and agriculture sectors; and
- To seize opportunities through various policy entry points to stimulate ongoing political commitment such finishing the MDGs and progressing towards achievement of the SDGs.

Containing AMR through actions towards Universal Health Coverage (UHC):

- a. Build resilient national health systems with clear accountability frameworks and mechanisms for implementing and monitoring actions to contain AMR at all levels;
 - b. Integrate strategies to slow the spread of AMR in national policies and plans for UHC development;
- Improve regulatory controls and health financing mechanisms (including quality assurance from manufacturers to authorized retailers and reducing financial incentives that contribute to inappropriate use) to ensure equitable access to quality antimicrobials to all who need them;
 - Implement antimicrobial stewardship programmes with full national coverage to improve prescribing practices of health-care providers and ensure the rational use of antimicrobials;
 - Develop and disseminate guidelines for diagnosis and treatment of common infectious diseases that take into account findings of surveillance of AMR;
 - Develop and implement strategies to strengthen infection prevention and control in health-care and community settings; and
 - Reduce the burden of infection through improved hygiene and sanitation, especially within poor and vulnerable populations.

Emphasize 'One Health' coordination mechanism in the implementation of National Action Plans

- a. Ensure harmonized multisectoral action across human and animal health, agriculture, food security and the environment with a clearly defined national governance mechanism that engages all relevant stakeholders and balances their interests and needs;
- a. Enact and enforce regulation of antimicrobials and control of the supply chain (including safe disposal and environmental controls) for humans, animals, agriculture and aquaculture;
- b. Develop and strengthen reliable, quality-assured surveillance systems to monitor the trends of drug-resistant pathogens and antimicrobial use in humans and animals;
- c. Limit the use of critically important antimicrobials for human health in food systems by improving the stewardship of antibiotics by animal health providers and promote sustainable agricultural practices;
- d. Optimize and expand vaccination programmes that can contribute to preventing AMR;
- e. Promote a concerted multisectoral food chain approach through using internationally recognized standards and guidelines such as the Codex Alimentarius and the OIE Standards and Guidelines; and
- f. Regulate production and domestic/international distribution channels of active pharmaceutical ingredients for antimicrobials and medicated feed;

- b. Establish effective monitoring and evaluation through strong accountability and mechanisms to oversee the implementation of multisectoral national action plans.

Securing regional collaboration across Asia-Pacific:

- a. Harmonize standards and methodologies for surveillance of AMR and antimicrobial consumption across countries and strengthen human and animal health networks to share data and take appropriate policy action;
- b. Share national experiences of successful regulatory practices to preserve the effectiveness of antimicrobials as a global public good in human and animal health;
 - Enforce prescription or veterinary-equivalent-only sales of antimicrobials in human and veterinary medicine;
 - Strengthen regulation on the use of critically important antimicrobials, based on scientific risk assessments, and phase out the use of antimicrobials as growth promoters in animals in the absence of risk analysis;
- c. Strengthen regional capacities and mechanisms to enhance research and development for new diagnostics, vaccines and antimicrobials that utilize innovative financing approaches; and
 - Increase commitments for research and development and innovation to facilitate investments, through a combination of incentives for new antimicrobials, diagnostics, vaccines and other interventions in human and animal health.

Discussion and our contribution in the ministerial meeting

In the final day (3rd day), senior officials and ministers of Health from different countries were present in the meeting with their country report. A country report from Bangladesh was also presented in this meeting. Recommendations from technical meeting identified priority action areas for implementation by the Ministers of Health on 16 April 2016.

Future action plan to combat AMR in animal agriculture:

- Awareness development in relevant stakeholders (Farmers, general public, professionals, policy makers other stakeholders) for judicious use of antibiotics in food animal production and to combat AMR.
- Improve International Standard laboratory facilities for ensuring quality services to the stakeholders.
- Capacity development on AMR issues through training, seminar and workshops.
- Hygienic farm practices with sanitary protocols for ensuring biosecurity from “farm to plate”.
- Introducing and implementation of The Fish and Animal Feed Act-2010 and The Animal Feed Rules-2013 in regards to antimicrobials use restriction in the fish and animal feeds.
- Strengthen the supervision and monitoring of antimicrobial use in animal feeds through the government officials.
- Regulation and monitoring of production, marketing and application of antibiotic alternative feed ingredients.
- Introduce AMR surveillance activities in animals and aquaculture.
- Enhance research and development (R&D) for finding cost effective antibiotic alternatives in feeds, novel antimicrobials, and vaccines.
- Logical feeding strategy with quality feed ingredients for animals and fish.
- Value chain and market development of animal originated food products.
- Strengthen the media coverage for awareness development, reporting and knowledge sharing.
- Collaboration among public health, animal health and animal agriculture through one health mechanism.
- Enhance local, regional and global collaboration to combat AMR in agriculture, livestock and aquaculture.

Recommendations

It is necessary to implement existing policies acts, and rules at field level to combat AMR in Bangladesh. However, impose to ban the use of antibiotics in animal feed for the purposes of growth promotion, and create awareness in the importance of stewardship, surveillance, and addressing issues related to over-the-counter access. In addition, the countries need regional approaches to combat AMR in animals as well as in human throughout the globe.

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Bibliography

1. Marshall BM and Levy SB. "Food Animals and Antimicrobials: Impacts on Human Health". *Clinical Microbiology Reviews* 24.4 (2011): 718-733.
2. Hossan Md Salim., *et al.* "Global restriction of using antibiotic growth promoters and alternative strategies in poultry production". *Science Progress* 101.1 (2018): 52-75.

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