

Production without Medicalization: AMR in Bangladesh's aquaculture, a one-health perspective.

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Disease-causing bacteria, viruses, and parasites can develop resistance to antimicrobial (AM) agents (like antibiotics, antivirals and antiparasitics) to which they were originally sensitive. This is known as antimicrobial resistance, or AMR, when treatments fail, infections persevere and spread to others. AMR is a "one-health" problem where the health of people, animals, plants and the environment are closely interconnected. In order to meet the global demand for aquatic animal proteins, the overall aquaculture production needs to double in the next 30 years. Intensification of the aquaculture sector will inevitably come with some diseases challenges and a risk to see an increase in antimicrobial use (AMU) to combat them making the sector a potential key site for the emergence and transmission of AMR.

Bangladesh is the world's third largest inland producer of fish and shellfish that contributes to the country's economic success. In recent years, the aquaculture sector has experienced a high disease burden often associated with an increase in antimicrobial use. In this context, one of the key challenges for Bangladesh Aquaculture is to maintain sustainable production without medicalization. As one of the Fleming Fund listed countries, Bangladesh receives financial support to tackle AMR with a specific focus on surveillance of antimicrobial use, resistant bacteria, and AMR risks.

An AMR workshop funded by the UK Economic and Social Research Council (ESRC) under the cross UK Research Council "Tacking Antimicrobial Resistance" program was held on the 12-13 of February 2019 in Dhaka, Bangladesh. The workshop followed on from two UK-funded research projects on the microbial dynamics of disease within Bangladeshi aquaculture and on the disease management practices on farms and in hatcheries. Over sixty participants attended the workshop representing the Department of Fisheries, the Government of Bangladesh, the UK Government, non-government, intra-government, commercial, academic researchers and practitioner communities from over 20 organizations (e.g. the University of Exeter, local universities, Cefas, WorldFish, FAO, WHO) from the human, livestock and aquaculture health sectors.

The workshop was co-organized and supported by the CGIAR Research Program on Fish Agri-Food Systems ([FISH](#)) led by [WorldFish](#) with contributions by the CGIAR Trust Fund.

The final report of the workshop written by Professor Stephen Hinchliffe from the University of Exeter can be found [here](#). Below is a summary with some of the highlights from the report.

The workshop had four aims that were to 1) gain a better understanding of key aquaculture practices in Bangladesh, diseases issues and drivers of resistance risks within the aquaculture industry 2) define a one health approach to tackle AMR in Bangladesh through new initiatives 3) discuss the utilization of this knowledge to raise AMR awareness in any public or farmer campaigns 4) identify data needs and approaches for future characterization of AMR issues in Bangladeshi aquaculture.

In order to obtain some tangible solutions to the challenges faced in Bangladeshi's aquaculture, workshop's participants were divided into three focus groups, namely, shrimp, finfish and integrated livestock and each group was invited to discuss and identify key messages on four broader themes:

Theme 1: Main uses of AM and sources of resistance risk in Bangladeshi aquaculture

While AM is used sparingly in Bangladeshi aquaculture to prevent or treat diseases. AMU is comparatively rare in sectors such as shrimp, and more common for finfish which is minor to the use in livestock (poultry). Medicines are becoming more common and freely available over the counter and shopkeepers are under pressure to stock

treatments and advise farmers to use them, with no or little veterinary supervision. There is usually no record keeping. The quality of treatment available is variable as counterfeit medicines are common and rarely designed specifically for aquaculture use. In some cases locally made feeds have been reported to contain antimicrobials.

Theme 2: Generating AMR awareness

There was a consensus that there is a need to establish a process for farmers to report diseases/abnormal mortalities and seek diagnostic support. Based on a diagnosis, farmers should seek professional advice if antibiotic treatment is required and which appropriate treatment to use. It was also recognized that farmers should only buy medicines from reliable sources that have been approved for aquaculture. It was recognized that the misuse and overuse of AM can have serious health impacts on producers, consumers and the environment. The overall discussion emphasized the need for a national campaign to highlight the importance of pond health environment and how to improve it.

Theme 3: Data needs and surveillance of AMU and AMR risks

There is a need for a surveillance program of production, diseases and resistant pathogens. For this, a significant effort must be made on developing laboratory capacity, training of personnel, and the use of recognized and effective testing methods. Strong suggestions were made for investment in health management practices (prevention and control) and for greater regulation of medicines and policy enforcement.

Funded by the Department of Environment Food and Rural Affairs (Defra) and the Fleming Fund, a joint program between the Department of Fisheries (DoF, Bangladesh), the Food and Agriculture Organization of the United Nations (FAO; Poultry, Bangladesh), WorldFish, the Centre for Environment Fisheries and Aquaculture Science (CEFAS), the Animal and Plant Health Agency (APHA) and the Veterinary Medicines Directorate (VMD) is in place to support coordination of training/education, capacity development, and to facilitate implementation of National Action Plans to enable international engagement to support action on AMR in Bangladesh.

Theme 4: Identifying key interventions

Since this area requires several partners to come together, DoF should be encouraged to develop a specific unit dedicated to the regulation of medicines use and the enforcement for compliance. Bangladesh Directorate General of Drug Administration (DGDA) can train fish health inspectors to act on their behalf to regulate and monitor AM uses at district levels. A similar initiative to the training of trainers (ToT) approach adopted by FAO with the Bangladesh Antimicrobial Resistance Alliance ([BARA](#)), can be applied in the aquaculture sector to raise awareness and inform the wider public around the issue of AMR in remote regions, stimulating the sharing and uptake of good practices for a one health alliance and foster AMU compliance at national level.

Conclusion

The workshop was concluded with some recommendations that were broken down into three broad areas, namely, Capacity, Surveillance and Awareness. These included developing a sustainable approach to training key personnel and training the trainers to deliver services needed within the laboratory and agricultural extension services. A coordinated surveillance program is needed to monitor antimicrobial sales, antimicrobial uses and antimicrobial resistances with an emphasis on aquaculture in order to provide good baseline data to inform interventions. Last but not least, it was recommended to develop tailored strategic awareness campaigns and approaches targeting farmers, shopkeepers, value chain holders and end users so as to have dual benefits of increasing reporting and to reduce overuse and misuse of antimicrobial treatments.

What's next?

1. Support the Fleming Fund's grant program by developing a protocol and guidelines for AMR surveillance in Aquaculture. WorldFish will lead this activity and will convene a workshop with main technical experts (WorldFish, Cefas, FAO, OIE, ILRI, etc.) to develop the protocol and having it peer reviewed. This will be followed by a pilot phase in four Fleming Fund countries (two in Africa and two in Asia).
2. The National Fish Health Management Strategy of Bangladesh (NFHMSB) recommends the "development of a national aquatic animal reference laboratory for diseases diagnosis, AMR, and aquaculture medicinal product (AMP)". The UK International AMR Reference centre (IAMRC) for aquaculture led by Cefas in collaboration with the DoF Bangladesh and WorldFish are planning to support laboratory capacity building to undertake AMR surveillance in aquaculture. This will be done in Bangladesh via training in aquatic animal health bacteriology diagnostics, and antimicrobial sensitivity testing of bacteria of aquatic origin. One of the aims is to pilot AMR projects to fully embed and validate, the principles established during the training, as well as to provide pilot data on AMR in Bangladesh culture systems.

Links for additional information on the topic

1. Peer-reviewed articles

- Hinchliffe S., Butcher A. & Rahman M.M. (2018). – The AMR problem: demanding economies, biological margins, and co-producing alternative strategies. *Palgrave Communications*, **4** (1), 142. doi:10.1057/s41599-018-0195-4 – Link [here](#)
- Henriksson P.J.G., Rico A., Troell M., Klinger D.H., Buschmann A.H., Saksida S., Chadag M.V. & Zhang W. (2018). – Unpacking factors influencing antimicrobial use in global aquaculture and their implication for management: a review from a systems perspective. *Sustain Sci*, **13** (4), 1105–1120. doi:10.1007/s11625-017-0511-8. – Link [here](#)

2. YouTube videos

- Tackling AMR in Bangladesh – a One Health approach (developed by the Food and Agriculture Organization of the United Nations) – Link [here](#)
- AMR in the Matrix -- An Irresponsible, Irresistible Parody (developed by BARA) – Link [here](#)

3. Animation

AMR animation to increase awareness on antibiotic usage in fish culture lead by the University of Exeter in collaboration with WorldFish and FAO – Link [here](#)

4. Facebook page

The Bangladesh Antimicrobial Resistance Alliance (BARA) – Link [here](#)

5. Blog story

Can Bangladesh's aquaculture be sustainable without antibiotic use and what is required to achieve this? – Link [here](#)