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IMPROVING CAPACITY IN BANGLADESH TO DETECT FECAL PATHOGENS IN AQUACULTURE

by Mohammed Badrul Amin and Clare Narrod

Staff in the Department of Fisheries (DoF) of Bangladesh had been planning to develop a rapid testing facility in their laboratory to meet demand for ensuring the safety of exported fish. Barkatul Alam, fish inspection quality control officer; Shafiul Alam, upazilla fisheries officer; and Tanzinah Nasrin, microbiologist from the DoF Quality Control Laboratory (QCL) said that although this was a goal, they faced challenges in setting up this molecular test in their laboratory as they lacked technical know-how and hands-on training.

Staff from Bangladesh's Department of Fisheries Quality Control Laboratory and Institute of Public Health National Food Safety Laboratory participate in hands-on training. Md. Khorshed Alam/icddr,b

Having the ability to test the microbiological safety of fish is important in Bangladesh as fish plays a pivotal role in diet, livelihoods, and culture. Over the past 20 years, Bangladesh has grown self-sufficient in fish production and expanded its exports to various countries including the European Union and United States. Bangladesh exported 73,171 metric tons of different types of marine fish and cultivable fish, including tilapia and pangas, between 2018 and 2019 according to the DoF. Unsafe growing practices, such as wastewater-fed aquaculture systems, create major concerns for quality control. Moreover, these practices may have negative impacts on human health due to the potential presence of fecal microbial pathogens like *E. coli*, *Salmonella*, *Shigella*, *Vibrio cholerae*, and *Vibrio parahaemolyticus* in the wastewater.

"Currently, the DoF is testing around 30 fish samples per day," said Barkatul Alam. He noted, "There is a need to be able process a larger number—nearly double the amount of samples—to meet the export demand. This can be done by increasing the laboratory testing capacity for identification of these pathogens, which is crucial for maintaining and increasing the fish export economy in Bangladesh."

The Feed the Future Innovation Lab for Fish project on Identifying Major Sources of Fecal Pathogens in Bangladeshi Aquaculture Value Chains and the Most Cost-Effective Risk Reduction Strategies organized lectures and a hands-on training for eight participants from the QCL and the National Food Safety Laboratory of the Government of Bangladesh's Institute of Public Health. The QCL routinely tests for *E. coli*, *Salmonella*, *Vibrio cholerae*, and *Vibrio parahaemolyticus* in exportable fish. They use conventional microbiology techniques to test these pathogens, which is time consuming and sometimes leads to confusion in identification of bacterial pathogens. In such situations, molecular techniques like polymerase chain reaction (PCR) help to conclusively detect and identify pathogens.

After receiving the training, the participants were excited to initiate this activity in their own laboratories. Barkatul Alam said, "We could also detect another pathogen named *Shigella* while investigating for *Salmonella*

PROJECT TEAM

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in fish samples, though we never tested *Shigella*. But from a fish perspective, *Shigella* is also an important parameter to examine and through this training we learned how to do confirmatory tests using both conventional and PCR detection of specific genes for *Shigella* and *Salmonella*. This has boosted our confidence level."

Barkatul Alam noted that "for water-sample testing we used to follow the same technique as for food samples, but through this training we learned that it should be different and we will set up a membrane filtration technique in our lab, which is the standard procedure for water-sample testing."

Nasrin said, "We never tested fish or water samples for *Cryptosporidium* in our lab, nor did we test any environmental swabs for fecal pathogens. We are motivated now to set up these parameters in our laboratory and will be able to contribute to the government surveillance system when it is required."

The participants also explained that the QCL tests samples of fish destined for export markets, but they had no prior experience in sampling fish and fish water from local markets. During the training, they learned that the way they processed fish samples and fish water samples prior to the training was not appropriate.

The participants noted they were also looking forward to learning how to do antimicrobial resistance (AMR) testing. Currently both Barkatul Alam and Shafiul Alam are in a fellowship program on AMR, funded through the Fleming fund in the United Kingdom, and have plans for developing AMR surveillance capacity in their labs focusing on food and environmental sectors. Shafiul Alam mentioned that they already use phenotypic tests to detect AMR in *E. coli*, but gene-level detection is not yet performed. He said, "AMR gene detection using PCR will be available once we set up this molecular technique in our laboratory."

Following the training, participants expressed a need to develop a rapid-testing facility that supports pathogen detection. They noted that this testing capacity could help the DoF and the National Food Safety Laboratory to improve their reporting accuracy and contribute to increasing revenue generation for Bangladeshi aquaculture. Improved testing will also contribute to better food safety for millions of Bangladeshis who consume fish as a regular part of their diets. The participants shared their enthusiasm about the impact of this training on their individual and institutional capacity building, confirming they are already beginning to implement the plans discussed during the training.

ABOUT THE FISH INNOVATION LAB

The Fish Innovation Lab supports the United States Agency for International Development's agricultural research and capacity building work under Feed the Future, the U.S. Government's global hunger and food security initiative. Mississippi State University is the program's management entity. The University of Rhode Island, Texas State University, Washington University in St. Louis, and RTI International serve as management partners.

www.feedthefuture.gov
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