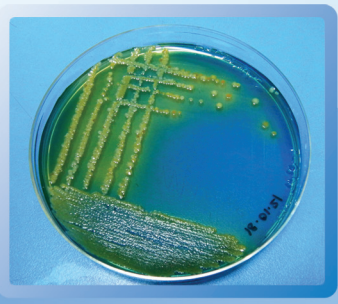
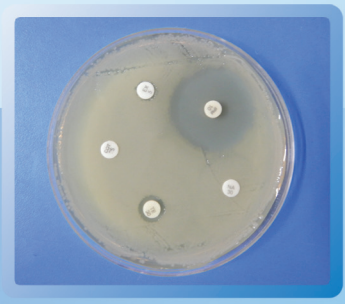
Good Aquaculture Practices to Mitigate Antimicrobial Resistance (GAqP-AMR) in Freshwater Fish Culture

Under FAO-TCP/RAS/3702 project
(Support mitigation of Antimicrobial Resistance risk associated with aquaculture in Asia)



Indian Council of Agricultural Research (ICAR), New Delhi
ICAR- National Bureau of Fish Genetic Resources (ICAR-NBFGR), Lucknow
ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), Cochin

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SIGNIFICANCE OF ANTIMICROBIAL RESISTANCE

- **Antimicrobial agents** are natural or synthetic substances that inhibit or kill microorganisms. In aquaculture, these are generally used for treatment of fish diseases caused by bacterial pathogens.
- **Antimicrobial resistance (AMR)** is a phenomenon in which microorganisms fail to respond to the antimicrobials to which they were initially susceptible. This will lead to treatment failure and economic loss to the farmers.
- **Impacts of AMR** are across the sectors. AMR can spread from aquaculture to human beings and from human beings to aquaculture. AMR has impact both on public health and fish health as antimicrobials become ineffective during treatment of diseases.
- **Good Aquaculture practices** are a package of on-farm practices that help the aquaculture farmers to produce safe fish by addressing issues related to environmental, economic and social sustainability (BIS, 2019).
- **Need for the Good aquaculture practices to control AMR (GAqP-AMR):** The inappropriate use (using more or less) of antibiotics in aquaculture farms leads to the emergence of AMR in bacteria present in the aquatic environment. AMR can enter into the aquaculture pond through several sources such as water, seed, feed, feed supplements, probiotics, manure, farm equipments, fishing nets, farm personnel, carrier animals and birds etc. Therefore entry of AMR in aquaculture needs to be prevented.

1. FISH HATCHERY

i) Broodstock management

- **Use water from bore well. Water from other sources like river, canal etc., must be disinfected in the reservoir pond before filling in the broodstock pond.**

  Presence of contaminants such as antibiotics, heavy metals, pesticides and harmful bacteria in water may lead to AMR.
- **Antibiotic free feed must be used for feeding the fish.**

  Use of feed containing antimicrobials may lead to emergence of AMR in the hatchery.
- **Advise of fish health expert must be taken before initiating any treatment for fish disease.**

  Improper diagnosis by non-experts might lead to unnecessary use of antimicrobials leading to the development of AMR.
- **Hatchery manager must strictly adhere to the use of approved antibiotics prescribed by fish health expert with suggested dose and duration.**

  Use of prohibited antibiotics and non-adherence to withdrawal period results in the presence of antibiotic residues in the edible fish tissue leading to food safety and AMR issues.
- **Use of any un-labeled product in the hatchery should be avoided. The label of the product must be checked for absence of antimicrobials before use.**

  Products without proper label may contain antimicrobials. Use of such items may lead to emergence of AMR.

ii) Spawning/Breeding

- **The egg debris should be removed at regular intervals, and incubation pool should be thoroughly cleaned and disinfected after every spawning cycle.**

  The egg debris is a nutrient rich source for microbial growth and can lead to infections.
- **Use of antibiotics in the spawning pool/ incubation pool must be avoided.**

  Use of antibiotics in water may lead to emergence of AMR.

iii) Seed rearing

- **Organic manure must be sourced from healthy animals or animals which have no history of antimicrobial usage.**

  This will prevent the introduction of antibiotic residues in the pond through organic manure.
- **Pond dykes should be high enough to avoid agricultural run-offs in the pond.**

  The run-off water from agriculture fields may contain harsh chemicals and pesticide residues. The use of this polluted water for aquaculture may confer co-resistance to the bacteria in fish pond.

2. AQUACULTURE FARM

i) Practices during pre-stocking phase

- **The design of the water inlet and outlet system should prevent cross contamination.**

Pond outlet discharges high organic loads and its contaminations into other ponds can promote growth of pathogenic bacteria. This might increase the use of antimicrobials.

- **In earthen pond, bottom soil should be sundried and ploughed after completion of each production cycle.**

Pond bottom has high organic loads which promotes growth of pathogenic bacteria. This might increase the use of antimicrobials.

ii) Practices during fish seed stocking phase

- **Stock only disease free, and active seed that are procured from hatcheries maintaining healthy broodstock.**

  Unhealthy seed are susceptible to disease leading to increase in the use of antimicrobials.

- **Follow optimum stocking density.**

  Overcrowding of fish leads to disease incidence and faster spread of the disease within the pond. This may necessitate use of antimicrobials and possible emergence of AMR.

iii) Practices during fish grow-out phase

- **Preferably use only those feed and feed supplements that were tested for the presence of anti-biotics by the manufacturers and are properly labeled on the feed bags or packets.**

Feed and feed supplements without proper label may contain antimicrobials. Use of such items may lead to emergence of AMR.

- **Avoid feed wastage by feeding at recommended quantities, and monitoring the feed consumption.**

  Unutilized feed accumulates at the pond bottom and results in higher bacterial loads, stress and disease incidence.

- **Aquaculture farmers should not use any of the prohibited antibiotics or other pharmacologically active substances notified by Government of India**

1. Nitrofurans (Furaltadone, Furazolidone, Nitrofurantoin, Nitrofurazone)
2. Chloramphenicol
3. Sulphamethoxazole
4. Aristolochia spp. and preparations
5. Chloroform
6. Chloropromazine
7. Colchicine
8. Dapsone
9. Dimetridazole
10. Metronidazole
11. Ronidazole
12. Ipronidazole and other nitromidazoles
13. Clenbuterol
14. Diethylstibestrol
15. Glycopeptides
16. Stilbenes and other steroids
17. Crystal Violet
18. Malachite Green
19. Carbodox

The use of these prohibited antibiotics and chemicals are of AMR concern. They also makes the fish unfit for human consumption (FSSAI, 2011; Version -V; 19.08.2020).The farmers cannot sell the fish in domestic market or export them if these prohibited substances are detected in the fish meat/edible tissue.

FOOD SAFETY AND STANDARDS (CONTAMINANTS, TOXINS AND RESIDUES) REGULATIONS, 2011

CHAPTER 1
GENERAL

1.1: Short title and commencement-

1.1.1: These regulations may be called the Food Safety and Standards (Contaminants, toxins and Residues) Regulations, 2011.

1.1.2: These regulations shall come into force on or after 5th August, 2011.

1.2: Definitions-

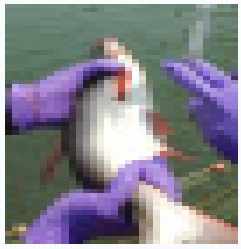
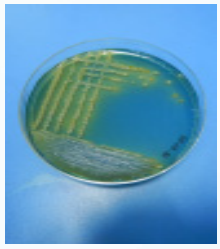
1.2.1: In these regulations unless the context otherwise requires:

1. "Crop contaminant" means any substance not intentionally added to food, but which gets added to articles of food in the process of their production (including operations carried out in crop husbandry, animal husbandry and veterinary medicine), manufacture, processing, preparation, treatment, packing, packaging transport or holding of articles of such food as a result of environmental contamination

CHAPTER 2
CONTAMINANTS, TOXINS AND RESIDUES

- **Farmers should obtain correct disease diagnosis by testing diseased fish in aquaculture disease diagnostic laboratories.**

  Improper diagnosis might lead to unnecessary use of antimicrobials.

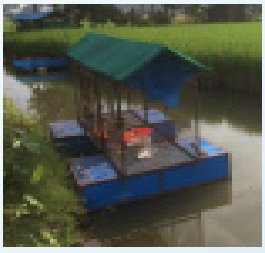




- **Farms should have better biosecurity measures such as bird nets, crab fencing, fomite disinfection using potassium permanganate etc.**

  Good biosecurity measures prevent the entry of infection into the farms and thereby reduce antimicrobial use.



- **In integrated aquaculture, do not use organic manure in the pond obtained from the diseased terrestrial animals (cattle, sheep, goats, pigs) and birds (chicken, ducks) which are under antibiotic treatment.**



  This will prevent the introduction of antibiotic in the pond through organic manure.

- **If organic manure is required as fertilizer for promoting plankton growth, then it must be sourced from healthy animals or animals which have no history of antimicrobial usage.**

  The organic manure from these animals may contain AMR bacteria that may be transferred to the fish.


iv) Fish harvest practices

- **Create awareness on Good hygiene practice and AMR among the fishermen/fish harvesters.**

- **Fishermen should take bath before entering into and out of the pond.**
- **Sanitize hands before handling the fish.**

  These measures will prevent transmission of AMR strains from humans to fish and vice versa.

- **Medical check-up of the fishermen/farm-workers should be performed at regular intervals and people free from contagious diseases should be allowed to be on the farm.**

  Infected individuals could be a source of AMR.

v) Post-harvest practices

- **Use only potable water for cleaning the fish.**
  Fish may get contaminated with bacteria harbouring AMR if washed in dirty water.
- **Fish handlers should wash their hands and sanitize in chlorine water (20 ppm) or recommended hand sanitizers before handling the fish.**
  Dirty hands contain large numbers of bacteria some of which may be of AMR concern.

- **A toilet should be provided at a safe distance from the farm for use by the personnel on the fish farm.**
  This prevents open defecation. Human faeces may contain bacteria of AMR concern.

Document prepared by

Principal Investigators:
Dr Gaurav Rathore &
Dr B. Madhusudana Rao

Co-Principal Investigators:
Mr Chandra Bhushan Kumar &
Dr K. Ahamed Basha

Coordinators:
Dr Kuldeep K. Lal & Dr Ravishankar, C.N.

National Coordinator:
Dr J.K. Jena