Aquaculture Bacterial Pathogens

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ABBREVIATIONS
GDP: Gross Domestic Product, ppt: Parts Per Thousand.

A significant part of Indian food production involves fisheries and aquaculture, which contribute to agricultural exports and employ around fourteen million people. Since independence, the nation has consistently increased fish production as a result of its vast aquatic resources. A total of 6.3 percent of world fish production comes from the industry, which contributes 1.1 percent to GDP and 5.15 percent to agricultural GDP. A total of 10.07 million metric tons of fish are produced in the inland sector, and around 65 percent are produced in the cultural sector. Increasing fish diseases have slowed aquaculture production and product trade in India, threatening fishermen's livelihoods. Infections can be caused by a number of factors, including low physicochemical and microbiological quality of culture water, high stocking density, and poor nutrition. It is possible for seed fish and adults to become deformed and die from exposure to pollution and suspended particles. As a result of different opportunistic bacterial infections and parasites, the fish industry suffers a significant loss in mortality and morbidity, decreased growth, and increased chemical control and prevention costs [1].

Various gram-positive bacteria are commonly associated with aquaculture, including *A. salmonicida*, *Vibrio* species, *Edwardsiella ictaluri*, *E. tarda*, *Aeromonas hydrophila*, *Streptococcus* species, and other similar types of bacteria [2].

As an acute or chronic bacterial infection, Yersiniosis (Enteric Redmouth Disease) can be fatal to highly bred salmonids. There are many chronic symptoms of *Yersinia ruckeri*, including darkening and bleeding of the lips (red mouth), skin, anus, and ends, inappetence, edema, and organ degeneration. Water quality and other factors increase the death rate, but exophthalmos, inappetence, edema, and internal organ deterioration are all chronic symptoms. An isolate of the organism is prepared from the internal organs of the affected fish and identified for diagnosis using pure cultures [3].

Channel catfish are most commonly infected with *Edwardsiella ictaluri*, which causes enteric septicemia. Water temperature increases between 22°C and 28°C in the spring and fall, and enteric (or intestinal) meningitis is more common. There are two types of meningitis: enteric (or intestinal) and meningeal. There are several types of lesions that can develop on infected fish, including large petechial hemorrhages around the mouth, operculum, and eyes, as well as red punctate lesions along the body walls. In addition to hemorrhagic enteritis, the gut may be filled with fluid or gas. Liver lesions are prevalent and may present as multifocal necrosis and bleeding [4].

An early diagnosis of Columnaris disease can be made by inspecting wet mounts of damaged skin or gill tissue for distinctive organisms. *Flavobacterium columnare* is the cause of columnaris disease in warm-water fish species. When diseased organisms are isolated on Ordal's or other cytophaga medium, sensitivity testing is difficult since *F. columnare* does not grow on the Muller-Hanton medium. Treatment with hydrogen peroxide or potassium permanganate may be successful if the disease is detected early. When the disease becomes chronic, a medication such as oxytetracycline or florefenicol is recommended. Salmonids and fish maintained in high organic loading environments are susceptible to bacterial gill disease caused by *F. branchiophilum*.

A number of factors contribute to it, including overcrowding, poor water quality, high levels of ammonia, and large organic loads and debris. Direct gill smears reveal swollen and mottled gills with patches of bacterial growth that may be verified under a microscope. In juvenile fish, this disease is associated with hyperplasia, adhesions, and deformities of the gill lamellae. It causes serious mortality and long-term morbidity. Prevention strategies include improving water quality and preventing

overstocking. If potassium permanganate is applied alone, followed by the addition of salt (2-5 ppt) to the system, the losses can be reduced. However, sanitation is essential for long-term success [5].

The disease burden in India, as it is in many other countries throughout the world, is a serious obstacle to aquaculture and economic and socioeconomic development. In addition to damaging fish farmers' livelihoods, some diseases have also disrupted the future development of the industry. The origin of many diseases in modern aquaculture is increased growth techniques without a fundamental understanding of the delicate balance between host, pathogen, and environment. It is usually associated with disease outbreaks in cultured animals suffering from environmental deterioration, which causes stress. A variety of environmental stressors in the aquatic environment, including poor water quality, high microbial load, low nutritional condition, and high stock density, might make it more likely for opportunistic pathogens to infect them. Bacterial, parasitic, and fungal pathogens are generally not parasitic; they are extremely tolerant of changes in their environments. The occurrence of saprophytic relationships occurs when conditions for parasitism are inappropriate. For example, stress elements in the environment can cause fungal infections.

CONFLICT OF INTEREST

None.

ORCID

Not available.

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