

Biosecurity and Fish Health Monitoring for Aquaculture Facilities

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Biosecurity is the protection of living organisms from any type of infectious organism. Thus, biosecurity in aquaculture is the protection of fish or shellfish from infectious (viral, bacterial, fungal or parasitic) agents. Designing an effective biosecurity program requires an understanding of the aquaculture operation, general principles of disease transmission, and knowledge of the fish or shellfish maintained in the facility.

Mortality due to diseases or decreased feed efficiency and/or decreased growth rates due to infectious processes are major factors for economic loss in aquaculture. In addition, as the density of fish or shellfish in an intensive aquaculture facility becomes more concentrated, the probability of individuals coming into contact with a potential pathogen becomes greater. Thus, safeguards to protect the health of both fish or shellfish in an aquaculture facility becomes very important. While aquaculture has made rapid advances in the past few years in fish and shellfish diagnostics, disease prevention and disease control measures lag significantly behind.

The primary goal of a biosecurity program in aquaculture is to prevent the introduction of any infectious organism into an aquaculture facility. Since this is not always possible, the goal may have to be modified to eliminate or control infectious diseases within the facility.

There are numerous potential sources of entry for an infectious agent into an aquaculture facility. These include additions of new stock (eggs, fry, fingerlings, production fish and broodstock); contaminated water or feed; humans, animals or equipment (fomites), and subclinical (asymptomatic) carriers within the existing stock (production fish or broodstock). Each of these potential sources needs to be evaluated and continuously monitored to prevent the entry of infectious organisms into the facility. Thus, a sound biosecurity program for a fish or shellfish aquaculture facility would incorporate a) disease prevention, b) disease monitoring, c) cleaning and disinfection between production cycles, and d) general security precautions.

Disease prevention includes the methods used to prevent the entrance of all potential pathogens into the aquaculture facility. One of the principle methods used to avoid the introduction of certain pathogens into an aquaculture facility is to purchase fish or shellfish from a producer selling certified specific pathogen-free stock. Though this does not

eliminate all potential pathogens, it does help reduce the risk of introducing the major pathogens of a fish or shellfish. Unfortunately, only a few species of fish (i.e. salmonids) or shellfish are presently sold in this manner. Thus, many producers have established in-house broodstock or spawning facilities to provide stock for their production facilities. In addition to disease avoidance, a rigid quarantine program should be incorporated to isolate any new arrivals at a facility. The time interval required for a quarantine period can vary, but will generally take between 45-60 days. During this time, the fish can be closely monitored for clinical signs of disease, sampled for diagnostic health techniques, and treated if warranted. Vaccination is another means of disease prevention in aquaculture. Though only a small number of bacterins are APHIS approved and commercially licensed for sale in the United States, it is only a matter of time before additional bacterins and vaccines are available to prevent or control a wide variety of bacterial and viral diseases in aquatic animals.

Another important method of disease prevention includes providing a pathogen-free water source. Thus, an “infected” water supply may require modern technology (mechanical filtration, chemical treatment, UV filtration, ozonation, etc) to make the water acceptable for a biosecure facility. Finally, optimal management techniques, including stocking densities, nutrition, and genetics) are essential for all aquacultured species to develop and maintain an optimal health and immunological status to fend off any potential pathogens.

Disease monitoring should be an essential part of any biosecurity program. This consists of regularly scheduled health evaluations of all stock in an aquaculture facility. Depending on the particular situation, this may include either lethal or non-lethal sampling or both. Non-lethal techniques may include gill, skin and fin sampling, blood analysis for hematology, blood chemistries, and immunological assays, while lethal sampling may include bacterial cultures, viral isolation and histopathology. Though none of these assays can completely guarantee that there are no potential pathogens in a fish or shellfish population, they do help reduce the risk of maintaining a pathogen in a population. An initial or pre-purchase health evaluation of new stock will establish baseline information about the fish or shellfish, and can provide valuable information if a disease occurs in a facility. Periodic monitoring can also help determine the number of individuals within a population that are infected, and the level or intensity of infection within that population.

An important area of disease prevention and control that is often overlooked in the aquaculture industry is disinfection. Routine disinfection is used to reduce the pathogen load in a facility, thereby reducing the risk of spreading an infectious organism between groups of fish or shellfish in a single facility. For example, providing an adequate number of containers of appropriate disinfectant for nets and other shared equipment is one method used to inactivate potential pathogenic organism. However, having separate equipment (nets, feed buckets, water sampling jars, etc.) for each production unit would be optimal in helping to eliminate the risk of contamination between production systems. Disinfecting live-haul vehicles after delivery of stock to farms or other facilities also helps to avoid bringing back a potential pathogen from these other sites. In addition, cleaning and disinfection of the aquaculture facility and associated equipment between production

cycles is very important and helps reduce the risk of spreading an infectious agent from one production group to the next.

Finally, general security precautions need to be established for each facility to help support the activities of both disease prevention and disease control. A manual of standard operating procedures (SOPs) should be assembled to provide a set of standard rules for biosecurity measures and disease monitoring. This should include such things as facility design, facility flow for both personnel and stock, rules for limited or restricted access to facility, required visitor log book, disinfection procedures for both personnel and equipment, a waste management plan, pest control guidelines, and general husbandry and management procedures. This manual should also incorporate procedures to be instituted if a disease is detected or an outbreak occurs. Record keeping is paramount to the success of any biosecurity program because it can provide accurate historical information about the health status, weight gains, feed consumption, vaccinations or treatments, and management practices of the facility.

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