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Editorial: Editors' showcase: disease and health management

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Editorial on the Research Topic

Editors' showcase: disease and health management

Aquaculture, the farming of aquatic organisms, stands as a crucial industry, providing a significant global source of seafood. As the world's population continues to grow, the demand for protein-rich food sources rises in tandem. However, the susceptibility of aquatic animals to diseases poses a constant threat, potentially leading to substantial economic losses.

The World Organisation for Animal Health (WOAH) identifies key pathogens affecting aquatic animals, commonly referred to as "listed diseases". These diseases have a severe impact on aquatic animals, prompting the establishment of international standards and guidelines by WOAH to manage and control their spread. In addition to these listed diseases, there are other relevant or emerging diseases causing mortalities in various fish and shellfish species worldwide. Efficient diagnostic tools for regular monitoring and early pathogen detection are crucial. These tools, along with preventive measures like vaccination programs, play a pivotal role in disease management.

Nevertheless, a comprehensive approach is essential, integrating these elements with good husbandry practices. This includes maintaining balanced nutrition, ensuring optimal water quality, and engaging in selective breeding for disease resistance. This holistic strategy aims to mitigate the impact of diseases on aquaculture operations."

Health is a critical aspect of aquaculture because diseases can lead to significant economic losses. Efficient diagnostic tools that allow to identify the pathogens in regular monitoring and early detection have to be combined with preventive measures that include vaccination programs to protect aquatic animals from specific diseases. However, a holistic approach that combines these elements with good husbandry practices including an adequate nutrition (balanced and nutritious diets), optimal water quality, selective breeding for disease resistance, should be applied to mitigate the impact of diseases in aquaculture.

Continuous research and innovation play a vital role in improving the overall health and sustainability of aquaculture operations. It is important to consider not only complex research innovations but other solutions based in common sense that are effective ways to fight diseases avoiding the spread of pathogens.

In this Research Topic, we have a collection of several articles pointing out some key aspects related to aquatic animal health that are not usually taken into account. As the review from [Elvevoll et al.](#) reports, we need to understand food safety practices and nutritional content of fish that are increasingly demanded by the society. It emphasizes the importance of sustainable food security and improved nutrition for global well-being,

highlighting the environmental and health challenges associated with land-based food production. A sustainable production of aquatic food focused in good aquaculture practices, biosecurity measures and infection management, will result in a healthy seafood consumption.

One example of the effect of aquaculture products on human health is the use of antibiotics. While antibiotics can be effective in controlling diseases in aquaculture, their use raises concerns about the development of antibiotic resistance in bacteria. This resistance can have adverse effects on both aquatic and human health, as antibiotic-resistant bacteria may spread through the food chain. To address these concerns, there is an ongoing effort in the aquaculture industry to promote responsible antibiotic use and find alternative disease management strategies. This includes improving overall farm management practices, implementing better biosecurity measures, and exploring the use of probiotics and vaccines as alternatives to antibiotics. Sustainable and responsible aquaculture practices aim to balance the need for disease control with minimizing the potential environmental and health risks associated with antibiotic use in aquaculture. Kumari et al. research focuses on optimizing bacteriophage cocktails for freshwater fish infections, demonstrating their efficacy in saving fish and highlighting their potential as alternatives to antibiotics. They propose Phage-based treatments as viable alternatives to antibiotics in aquaculture. These approaches provide targeted specificity, reduce the risk of antibiotic resistance, are environmentally friendly, and allow for customization based on the specific bacteria causing infections. Despite these advantages, challenges exist, such as the need to carefully match the specific phages to the targeted bacteria and address issues related to phage stability and delivery. Ongoing research and development in phage therapy for aquaculture aim to overcome these challenges and establish it as a sustainable and effective alternative to traditional antibiotic use in the industry.

Patanasatienkul et al. concentrate on the biosecurity measures adopted by shrimp farmers in Indonesia. Infectious diseases outbreaks are influenced by various factors related to hosts, the environment, and husbandry practices. Effectively managing farms helps decrease the likelihood of introducing harmful pathogens to a farming site. This should be the first preventive method to fight diseases. If the introduction of pathogens cannot be prevented, addressing the factors that facilitate their spread within farms helps minimize the potential impact on shrimp health, mortality, and subsequent economic losses. It is crucial to recognize that biosecurity practices exert a direct and measurable influence on the occurrence and transmission of pathogens within and among farms that significantly impacts the overall productivity of the facility.

Elsheshtawy et al. investigate the impact of *in situ* net cleaning on the gill health of Atlantic salmon and rainbow trout, revealing diverse fouling species and changes in water quality. Concerns include potential negative effects on fish health and farm infrastructure. Although only moderate changes in gill inflammatory and antigen presentation activity was observed, a significant change happened in the gill microbiome induced a decreased bacterial richness and decreased diversity. Also, biofouling organisms may act as transient

reservoirs for some fish pathogens. With all these results, the authors suggest that changes in gill microbiome could be related to the host stress response to the process of net cleaning and could be indicative of increased mortalities post-cleaning. Microbial dysbiosis or the imbalance of the normal microbial communities of the gills of cultured aquatic species can have negative consequences for the cultured fish since gills play a crucial role in respiration, osmoregulation, and immune defense in fish and other aquatic organisms. Therefore, the use of non-lethal gill microbiome assessments in parallel to standard pathogen monitoring throughout the marine cycle may have potential as a refined health management tool.

In summary, aquaculture, faces several challenges related to health and sustainability. Addressing these challenges is crucial for the long-term success of the industry. Some of the key challenges for aquaculture health include a) controlling the spread of pathogens implementing effective biosecurity measures and developing efficient and fast diagnosis tools, b) developing effective vaccines against the main aquaculture diseases, c) Maintaining optimal conditions in the farms concerning water quality or sustainable and healthy diets. Efforts to address these challenges require collaboration among researchers, industry stakeholders, and policymakers to develop and implement sustainable and responsible aquaculture practices.

Efforts are being made globally to address these challenges through research, technological innovation, improved management practices, and international collaboration to promote sustainable and responsible aquaculture. This includes the development of alternative feed sources, advancements in disease management, and the promotion of environmentally friendly and socially responsible aquaculture practices.

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