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Editorial: The transmission and prevention of infectious diseases in aquatic animals

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Editorial on the Research Topic
The transmission and prevention of infectious diseases in aquatic animals

With an increase in the global population, there has been a corresponding rise in the demand for marine and freshwater products. This trend has resulted in a significant depletion of wild aquatic resources, prompting countries worldwide to focus their attention on aquaculture. Over the past few decades, technological advancements and the optimization of breeding techniques have led to substantial growth in global aquaculture production. However, this rapid development of aquaculture has led to a gradual increase in the incidence of viral, bacterial, fungal, and parasitic infections. Furthermore, global warming and the cross-border trade of aquatic animals products have heightened the risk of epidemic transmission. Despite concerted efforts to combat infectious diseases, they continue to pose a significant challenge to the sustainable growth of the aquaculture industry. This Research Topic centers on emerging diseases affecting cultured fish and shellfish, exploring the intricacies of host–pathogen interactions as well as the interplay between disease occurrence and environmental factors.

It is crucial to conduct epidemiological investigations when a disease first occurs. Clarifying the pathogen types, diversity, and distribution, as well as understanding the epidemic season, temperature variations, and other environmental conditions associated with disease transmission, are of paramount importance for implementing effective prevention and treatment strategies. On this topic, Gao et al. conducted a three-year investigation on the epidemiology of bacterial diseases affecting turbot in primary aquaculture regions in China. Their study revealed that bacteria pose a primary threat to the Chinese cultured turbot industry, with *Edwardsiella piscicida* identified as the main pathogen. Furthermore, indiscriminate use of antibiotics may lead to rapid drug resistance. Therefore, alternative prevention and treatment methods, such as vaccine development are crucial for the future sustainable growth of turbot aquaculture. Ye et al. evaluated the

prevalence of *Perkinsus* spp. among different marine mollusk species in several areas of China. It is speculated that the spread of *Perkinsus* to other mollusks may have occurred by transporting *Perkinsus*-carrying Philippine and Hong Kong clams. The carriage of *Perkinsus* is generally associated with a broader geographical range, a lower prevalence, a greater diversity of mollusk hosts, and a wider variety of *Perkinsus* haplotypes. Kannimuthu et al. conducted an evaluation and comparison of the susceptibility of *Salmo salar* and *S. trutta* to Piscine orthoreovirus-1 (PRV-1) infection and the development of heart and skeletal muscle inflammation at different life stages, revealing that *S. trutta* exhibits a lower susceptibility to PRV-1 infection compared to *S. salar*. Moreover, they confirmed the species-specific susceptibility to PRV-1 infection and disease development. Their findings provide significant guidance in determining the occurrence of this disease.

The intensification of human activities has resulted in numerous global climate issues that have significantly altered the temperature, pH, and other environmental factors in various water bodies. Consequently, new diseases emerged in some regions. Identifying novel illnesses that may arise from climate change is vital for their prevention. Stokowski et al. suggested that biogeochemical processes associated with climate change may constitute at least one component of the etiology of ulcerative dermal necrosis. Additionally, they emphasized the need for systematic monitoring to comprehend these processes and their repercussions. This is crucial for restoring and maintaining the sustainability of coastal systems that affect marine life and human well-being.

The interaction between pathogens and their hosts in aquatic animal diseases has long been a prominent area of research. Feng et al. used transcriptome technology to investigate the mechanisms underlying germ cell changes induced by *Polyascus gregaria*, a parasitic rhizomorphic nematode affecting *Eriocheir sinensis*. 104 genes exhibited significant differential expression compared with healthy males, including several upregulated genes associated with spermatogenesis. In addition, significant upregulation was observed in certain immune-related genes, including those coding for double whey acidic protein domain-containing proteins and serine protease inhibitors. These findings suggested that *P. gregaria* alters the developmental process and structure of male host germ cells, leading to the inhibition of sperm proliferation and maturation. Multiple host immune pathways were activated to counteract the *P. gregaria* invasion. Two leucine-rich repeat (LRR) only containing proteins (PtLRR1 and PtLRR2) were identified in *Portunus trituberculatus*, both exhibited predominant expression in the hepatopancreas and a time-dependent response to bacterial and viral stimulation. The LRR motif is evolutionarily conserved in many pattern recognition receptors. Knockdown of either PtLRR1 or PtLRR2 resulted in reduced *Vibrio* clearance, suggesting that PtLRR1 and PtLRR2 have the potential to serve as immune receptors in crabs by regulating antimicrobial immunity (Zhang et al.). These results provide a foundation for elucidating the mechanisms underlying disease prevention and control in crustaceans.

We anticipate that readers will benefit from these articles in their research endeavors and engage in active discussions with the authors to stimulate novel research ideas, ultimately leading to improved outcomes for aquatic animal disease prevention and control.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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