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Editorial: Aquatic microorganism and their response to environment virulence and antimicrobial resistance

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Editorial on the Research Topic
Aquatic microorganism and their response to environment: virulence and antimicrobial resistance

Overloaded or poorly managed farming systems, in synergy with emissions from intensive human activities and unstable climate systems arising from global climate change, can lead to environmental degradation, create imbalances in microecosystems, and result in pathogen blooms. These issues can significantly impact aquaculture and human health, leading to frequent outbreaks of bacterial infections and greatly increasing the risk of antibiotic resistance. Therefore, ensuring the health of aquatic animals and humans requires maintaining an early detection system for diseases, constantly monitoring the usage of antimicrobial agents (AMU), establishing national surveillance programs for antimicrobial resistance (AMR), and providing guidance for their application and prudent use, and actively promoting environment/ecosystem friendly strategies for disease management.

This Research Topic of Frontiers in Marine Science contains articles that investigate the aquatic microbial community, environmental changes, bacterial virulence, AMR, and their relationships. The main objective is to establish ecological prevention and control systems based on environmental factors and inputs, aiming to mitigate the occurrence and transmission of diseases.

Huang et al., Lin et al., Han et al., and Su et al. conducted investigative studies. Huang et al. examined the Liaohe estuary to explore the distribution and coexistence of potentially pathogenic bacteria. They found that Vibrio was the most potentially pathogenic bacteria in the estuary, with spatial factors having a more significant influence than environmental

ones. Huang et al. also showed that potential opportunistic pathogens could increase the risk of multiple infections due to their significant co-occurring relationship. Lin et al., Han et al., and Su et al. investigated the microbiological community and/or specific pathogens, such as Vibrio and their respective antibiotic and/or heavy metal resistance profiles in different aquatic systems. They investigated the driving factors of antibiotic and/or heavy metal resistance among bacterial communities, mobile genetic elements and selected environmental factors. Their studies suggest that resistance levels, microbiota, and environmental factors should be routinely monitored to assess risk levels and ensure human and aquatic animal health.

Su et al., Jiang et al. and Deng et al. conducted independent studies exploring the pathogenic mechanisms and/or horizontal gene transfer (HGT) driving factors of Vibrio strains. Su et al. discovered that various physicochemical factors, including pH, temperature, and salts, affect the expression of leucine-responsive regulatory protein (Lrp), which negatively controls the virulence of V. alginolyticus in zebrafish. Jiang et al. observed that after four weeks of cultivation, marked changes occurred in the morphology and physiological activity of V. mimicus. Moreover, well known virulence-related genes were significantly downregulated. Deng et al. reported a breakthrough in improving the conjugation efficiency of V. harveyi through appropriate treatments, which could contribute to the horizontal transmission of bacterial virulence and drug resistance. From the perspective of virulent (regulatory) gene expression (endogenetic) or HGT (externally acquired) regulation, Su et al., Jiang et al., and Deng et al. suggest that environmental changes, including physicochemical factors and nutrition, regulate the virulence and/or resistance of aquatic pathogenic Vibrio bacteria.

Liu et al. and Zhang et al. focused on different methods to control pathogenic bacteria. Liu et al. reported their findings on the potential of seagrass canopy structures in coastal areas to mediate the removal of putative bacterial pathogens. They observed that the density and height of seagrass patches influenced their ability to remove different kinds of pathogens. Liu et al. suggested that fragmented seagrass meadows might hinder their potential to remove bacterial pathogens, emphasizing the importance of seaweed meadow protection and restoration for human and marine organism health. Zhang et al.'s research explored the efficacy of UVC-LEDs as a novel light source to inactivate pathogenic bacteria. They investigated the effects of UVC-LED dose, light conditions, and temperature on bacterial reactivation and found that a higher UVC-LED fluorescence led to an increased inactivation rate. Pathogens were revived after UVC-LED disinfection, with photoreactivation significantly higher than dark reactivation. Based on their findings, Zhang et al. suggested that sufficient UVC-LED irradiation and avoidance of visible light after UVC-LED disinfection can effectively inhibit bacterial reactivation, providing reference information for designing and operating UV disinfection systems in aquaculture.

In summary, this Research Topic includes articles investigating the virulence and AMR of aquatic systems in estuaries and coastal zones affected by human activities. These studies explore the regulatory mechanism of a single bacterial organism's virulence and AMR and offer strategies for controlling pathogenic bacteria through biological and physical methods. The authors also examine the effects of various biological and physicochemical factors on virulence and AMR. Overall, these findings provide valuable insights into virulence and AMR control measures that can contribute to ensuring the health of aquatic animals and humans.

Author contributions

YD, SF, L-HL, JF, and JH worked collaboratively in designing the Research Topic, inviting authors, editing manuscripts, and editorial monitoring. It is also commendable that all authors contributed to the article and approved the submitted version. Collaborative efforts among researchers can lead to high-quality research outcomes and publications.

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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