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Advanced aquaculture: implementing effective biosecurity measures for future growth

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Abstract:

Biosecurity is a fundamental component of sustainable aquaculture, essential for preventing disease outbreaks, reducing economic losses, and maintaining the long-term viability of fish farming operations. Despite growing recognition of its importance, aquaculture faces diverse challenges, including the increased risk of pathogen transmission, lack of harmonized health regulations, and difficulties in implementing effective biosecurity measures. The COST BETTER initiative aims to enhance biosecurity through innovative disease prevention and control strategies. This paper explores key biosecurity aspects in aquaculture, emphasizing the need for improved pathogen surveillance, risk assessment, and proactive regulatory frameworks. Without clear guidelines, many fish farmers struggle to implement adequate biosecurity protocols, leading to persistent disease risks. Addressing these gaps is crucial for the next decade. Advancements in molecular diagnostics, biosensors, and real-time pathogen detection technologies provide rapid and precise disease identification, improving early intervention strategies. Additionally, next-generation vaccines, probiotics, microbiome modulation, and genetic selection for disease resistance are explored as promising solutions to strengthen aquaculture resilience. Strengthening biosecurity strategies will not only enhance fish welfare and production efficiency but also contribute to the global stability of aquaculture as a vital food source.

Keywords: aquaculture biosecurity, sustainable aquaculture, disease management