THE APPLICATION OF HKALM AS A PLATFORM FOR ORAL PLASMID DELIVERY IN SHRIMP AQUACULTURE

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Abstract

Shrimp aquaculture faces significant challenges from viral diseases, such as white spot syndrome virus (WSSV), which cause high mortality and economic losses. Vaccination offers a potential solution, but practical oral delivery systems remain limited. This study highlights the successful application of heat-killed attenuated *Listeria monocytogenes* (HKALM) as a novel, safer platform for oral plasmid delivery in shrimp aquaculture. Implementing a triple-layered safety approach-bacterial attenuation, a suicide mechanism, and heat-killing-HKALM effectively addresses key safety concerns associated with live bacterial systems, providing a practical alternative for large-scale aquaculture applications. Experimental results demonstrated that HKALM efficiently delivers plasmids into shrimp cells, as shown by GFP expression in both hemocytes and intestinal cells. Further, HKALM facilitated WSSV envelope protein VP53A expression, boosting PO activity and reducing shrimp mortality by 30%–40% in field trials. These findings confirm the viability of HKALM for mitigating WSSV infections in shrimp farming. While the protective effects of VP53A were evident, the study identified several limitations, including delayed gene expression onset and transient immune stimulation. This suggests the need for continuous feeding or optimized dosing regimens to sustain the desired effects. Overall, this study establishes HKALM as a promising platform for oral vaccine development in aquaculture. Future research should refine delivery efficiency, explore synergistic strategies to enhance immune responses and assess the scalability and long-term ecological influence of HKALM-based systems. These efforts will be crucial to fully maximize the potential of this innovative technology for sustainable shrimp farming.

Keywords: vaccine, oral drug delivery system, white spot syndrome virus, HKALM, Listeria monocytogenes, Litopenaeus vannamei.

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