
Antibacterial efficacy of novel antimicrobial peptide Q4-15 against *Vibrio parahaemolyticus*

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Abstract

Grouper farming has been threatened by various diseases. Among them, vibriosis is one of the most common bacterial diseases. However, the abuse of antibiotics in aquaculture results in the rapid emergence of bacterial resistance. Recent studies have shown that antimicrobial peptides (AMPs) are of greatest potential to serve as antibiotic substitutes. In our previous studies, AMP Q4 showed promising antimicrobial activity and selectivity against a broad spectrum of Gram-positive and Gram-negative bacteria including *Vibrio* spp. Based on structural parameters, a truncated derivative Q4-15 was obtained with enhanced selectivity. This study aims to investigate in vitro and in vivo antibacterial efficacy of Q4-15 against *V. parahaemolyticus*. Q4-15 exhibited nice antibacterial activity (MIC = 32 $\mu\text{g}/\text{mL}$) with low hemolytic effect (MHC = 256 $\mu\text{g}/\text{mL}$). In addition, *V. parahaemolyticus* was completely killed by 4xMIC Q4-15 (128 $\mu\text{g}/\text{mL}$) in 30 minutes, showing dose-dependent bactericidal activity. *V. parahaemolyticus* biofilm was eradicated over 99.9% of bacteria with only 2xMIC of Q4-15 (64 $\mu\text{g}/\text{mL}$). Different dosages of Q4-15 were applied as feed additives for groupers infected with *V. parahaemolyticus*, Q4-15 was found to improve survival rate while decreasing the bacterial load in liver of infected groupers. Gene expression of MyD88 and IL-1 β were lower in Q4-15-treated group, while IL-6 and TNF α returned to original levels at 48 hours after infection, suggesting that Q4-15 may have the ability to regulate the immune response in infected groupers. Taken together, these findings indicated that novel AMP Q4-15 may serve as a promising therapeutic agent against vibrio infection in groupers.

Keywords: Grouper, Antimicrobial peptides, *Vibrio parahaemolyticus*, Aquaculture

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