Novel Identification of Probiotic-Bacteriophage Combination Therapy for Vibrio Coralliilyticus in Aquaculture

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An estimated $6 billion USD will be lost in 2026 globally due to disease outbreaks in aquaculture facilities, particularly from Vibrio coralliilyticus, a pathogen that infects corals, fish and bivalves. This study explores a novel probiotic-bacteriophage therapy to inhibit V. coralliilyticus strain OCN008 for both prophylactic and post-infection use. Coral bacterial isolates (P94, B95, R96, Y97 & V44) were combined with bacteriophage 28A in a series of 5 experimental conditions. In initial screenings, combination therapy efficacy was compared to individual therapy efficacy to determine if the combination produced a synergistic effect. It was found that 3 combination therapies (B95+28A, Y97+28A & V44+28A) produced complete bacterial inhibition in 96-well plate assays ($p<0.0001$) and were more effective than the individual therapies. The combination therapies retained efficacy from 0.1 to 1000x pathogen-treatment ratios, with R96+28A producing complete inhibition ($p=0.0043$). Timing of introduction experimentation identified that the combination therapies prove most effective post-infection, followed by prophylactic and simultaneous introduction, respectively, with 3 combination therapies (P94+28A, B95+28A & R96+28A) significantly inhibiting bacterial growth ($p<0.0001$). Prophylactic in vitro assays identified two combination therapies (Y97+28A & V44+28A) as retaining prophylactic efficacy for up to 7 days ($p<0.0001$). In vivo experimentation using Eastern oyster larvae identified P94+28A & Y97+28A as producing significant survival rates ($p<0.0001$), effectively overcoming the approximate 81% mortality rate observed within 24 hours of infection. Future work is focused on biofilm disruption and microscopy to determine treatment-pathogen interactions within hosts.

Awards Won:
Second Award of $2,400