

Probiotic strains for shellfish aquaculture: protection of eastern oyster, *Crassostrea virginica*, larvae and juveniles against bacterial challenge

ABSTRACT

Bacterial pathogens, including several *Vibrio* spp. and *Roseovarius crassostreae*, cause severe mortality of larval and juvenile eastern oysters. The introduction of beneficial bacterial isolates in oyster hatcheries and nurseries for the biocontrol of bacterial diseases is a good alternative to the use of antibiotics. The goal of this study was to screen and characterize marine bacterial isolates as potential agents to prevent larval and juvenile mortality by the oyster pathogens *Vibrio tubiashii* and *R. crassostreae*. Screening of bacterial isolates from Rhode Island marine organisms and environment using agar-based assay methods for detection of antimicrobial activity against oyster pathogens led to the isolation of candidate probiotics *Phaeobacter* sp. S4 and *Bacillus pumilus* RI06-95. Pretreatment of larval and juvenile oysters for 24 h with 10^6 cfu/mL *Phaeobacter* sp. S4 or *B. pumilus* RI06-95 protected larval oysters against mortality resulting from challenge with *R. crassostreae* and *V. tubiashii* (relative percent survival (RPS) range, 9%–56%). These probiotics also protected juvenile oysters against challenge with *V. tubiashii* (RPS, 37%–50%). Probiotic isolates had no negative impact on oyster survival. Protection conferred to larvae against bacterial challenge was short-lived, lasting for only 24 h after removal of the probiotics from the incubation water. These results suggest the potential of marine bacterial isolates *Phaeobacter* sp. S4 and *B. pumilus* RI06-95 to serve as biocontrol agents to reduce the impact of bacterial pathogens in the culture of *Crassostrea virginica*.

Keyword: *Crassostrea virginica*; Oyster juveniles; Oyster larvae; Probiotic bacteria; *Roseovarius* oyster disease; Shellfish hatchery; Shellfish nursery; *Vibrio tubiashii*; Vibriosis