

Biofilm inhibition and antimicrobial properties of silver-ion-exchanged zeolite a against vibrio spp. marine pathogens

ABSTRACT

A challenging problem in the aquaculture industry is bacterial disease outbreaks, which result in the global reduction in fish supply and foodborne outbreaks. Biofilms in marine pathogens protect against antimicrobial treatment and host immune defense. Zeolites are minerals of volcanic origin made from crystalline aluminosilicates, which are useful in agriculture and in environmental management. In this study, silver-ion-exchanged zeolite A of four concentrations; 0.25 M (AgZ1), 0.50 M (AgZ2), 1.00 M (AgZ3) and 1.50 M (AgZ4) were investigated for biofilm inhibition and antimicrobial properties against two predominant marine pathogens, *V. campbelli* and *V. parahemolyticus*, by employing the minimum inhibitory concentration (MIC) and crystal violet biofilm quantification assays as well as scanning electron microscopy. In the first instance, all zeolite samples AgZ1–AgZ4 showed antimicrobial activity for both pathogens. For *V. campbelli*, AgZ4 exhibited the highest MIC at 125.00 μ g/mL, while for *V. parahaemolyticus*, the highest MIC was observed for AgZ3 at 62.50 μ g/mL. At sublethal concentration, biofilm inhibition of *V. campbelli* and *V. parahemolyticus* by AgZ4 was observed at 60.2 and 77.3% inhibition, respectively. Scanning electron microscopy exhibited profound structural alteration of the biofilm matrix by AgZ4. This is the first known study that highlights the potential application of ion-exchanged zeolite A against marine pathogens and their biofilms.