

Muting Messages: Boronic Acids Reduce Quorum Sensing and Associated Fitness in *E. coli*

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Quorum Sensing (QS) is a bacterial communication pathway that mediates population-based activity such as virulence and biofilm formation. Specifically, QS affects biofilm maturation, including the production of Extracellular Polymeric Substances (EPS), and competence, leading to increased antibiotic-resistance. QS also strengthens bacterial metabolic activity in the presence of selective pressures. *Escherichia coli* is an opportunistic pathogen that performs QS through the *luxS/lsrR*-mediated system utilizing Autoinducer-2 (AI-2) as the primary signal. The LuxS synthase is present among various WHO priority pathogens while AI-2 acts as a “universal autoinducer” that bridges interspecies communication, making *E. coli* a model organism for QS research. This study explores the effects of boronic acids indole-4-boronic acid and 6-Bromo-3-pyridinylboronic acid on QS-induced *E. coli* fitness, focusing on EPS protein density, competence, and metabolic activity. Crystal Violet and Bradford assays were performed on Biofilm of *E. coli* grown in media containing boronic acids and were normalized against calibration curves to quantify biofilm and protein, respectively. Competence was tested by measuring post-transformation growth of cultures through OD600. Cultures were stained with alamarBlue® to measure metabolic activity. Both boronic acids decreased both total biofilm and EPS protein quantities, but increased protein density; decreased competence; and decreased metabolic activity. Overall, both boronic acids significantly affect biofilm mechanisms to decrease adaptability for selective environments and overall fitness. As low-resistance-risk supplements to traditional antibiotics, these boronic acids introduce a novel approach to treating chronic or recurring infections.

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