Novel Compound for Cystic Fibrosis: Antibiofilm Effects of Pentagalloyl Glucose on P. aeruginosa

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Pseudomonas aeruginosa is an opportunistic bacterium that causes serious infections in immunocompromised patients, such as those who have severe wounds or cystic fibrosis. Although many antibiotics are available for treatment of P. aeruginosa infections, adaptive resistance mechanisms in bacteria can cause antibiotic resistance and bacterial biofilm formation, and increase the bacterial persistence and survival. In cystic fibrosis, biofilm complexes can thicken the already sticky mucoid secretions, which can result in chronic lung infections that increase the likelihood of life threatening complications. Our research explores the antimicrobial and anti-biofilm effects of pentagalloyl glucose (PGG). Its antimicrobial properties were determined through culturing P. aeruginosa strains PAO1 and resistant strain PA14 in the presence of PGG, and recording the bacterial growth curve through absorbance (OD) measurements. Its anti-biofilm properties were determined through culturing PA14 in the presence of PGG, and quantifying the biofilm cells through crystal violet staining. Our results show that PGG inhibits 30.5% growth of PAO1, 38.7% growth of PA14 and causes 41.3% reduction of biofilm formation of PA14. PGG was shown to be a more effective inhibitor of PA14 growth and biofilm formation than the antibiotic Rifampicin, as well as current commercial anti-biofilm agents like nitrofurazone and silver hydrogel. Possible applications include combining PGG with existing antimicrobial treatments for resistant strains of P. aeruginosa, and coating medical devices that are susceptible to biofilm formation with PGG to reduce biofilm formation. This novel compound could greatly help reduce the susceptibility of immunocompromised patients to this highly virulent bacteria.