Prevention Is Better than a Cure: A Novel Approach to Inhibit Pseudomonas aeruginosa from Creating Biofilms

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Formation of biofilms by Pseudomonas aeruginosa bacteria on medical device implants in human beings has become a common issue. To remove the biofilms, the implant devices have to be surgically removed and replaced, putting the patient's life at risk due to multiple surgeries. The goal of the experiment was to identify a natural substance that can be coated on the surface of these medical device implants inhibiting the growth of bacteria and biofilms, thereby eliminating the need for additional surgeries to remove biofilms. After creating extracts of curcumin at concentrations of 300µg/ml, 350µg/ml and 400µg/ml, the experiment was conducted using three independent methods. Method 1 used a dissecting microscope with a fluorescent camera to take high definition pictures of the samples and controls. Visual validation indicated that the samples with curcumin were successful in inhibiting the growth of the biofilm, while the biofilm was clearly visible in the positive control samples. Method 2 used a microplate photometer to measure the light absorbance. Samples with curcumin had significantly lower percentage of light absorbance (average 1.07% for 300µg/ml) when compared to the positive control (100%). Method 3 used flow cytometry to measure cell count in the samples and the control. Average cell count was the lowest (224) when 300µg/ml concentration of curcumin was used, while the positive control cell count was significantly higher (120,066). The results from the three methods validated that curcumin successfully inhibited the growth of Pseudomonas aeruginosa and its biofilm, and was especially effective at the concentration of 300µg/ml.

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