Enhanced Antibacterial Effect of Blue Light in Combination With an Amazonian Tree Sap (Croton lechleri)

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8.2 million patients in the U.S. suffer from non-healing wounds infected with antibiotic-resistant bacteria. Blue light and Sangre de Drago (SD) (Croton lechleri) have potent mechanisms of antibacterial action through free radical formation and anti-biofilm effect. We evaluate the enhanced antibacterial effect of this novel combination treatment. Preliminary dosimetry revealed effective SD concentration (5%) and 415-nm blue LED light fluence (125.3 J/cm 2). E. coli K-12 (0.1-mL, 2x10 5 CFU/ml) was applied to TSA plates, distributed in four groups: (1) no treatment (Control), (2) SD-only, (3) blue light-only, and (4) SD + blue light. Plates were incubated for 12-hrs at 37 Celsius. Colony forming units (CFUs) were analyzed using Image J software. Average CFU count was highest in the control group (121), followed by SD-only (60), blue light-only (27) and combination treatment (0). Average CFU size was largest for control (0.47 mm 2), followed by blue light only (0.3135 mm 2), and SD-only (0.17 mm 2). Blue light-only caused marked reduction in CFU count, while CFU size was only moderately reduced over the control, which may be due to light exposure field effect and peripheral colonies having less inhibition for growth. SD-only showed moderate decrease in CFU count, but had the largest decrease in CFU size. This may be explained by similar mechanisms to those involved in antibiofilm effect, impairing colony growth. Combination blue light and SD resulted in no bacterial growth. Treatment with 5% SD and 415-nm blue light works via complementary mechanisms, enhancing the antibacterial effect. They are not affected by typical bacterial antibiotic resistance pathways and could provide a valuable therapy in these infections and for chronic, non healing infected wounds.

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