Blue LED Light (470 nm) Effectively Inhibits Bacterial and Fungal Growth

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Source:
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Abstract

Blue light (470 nm) LED antimicrobial properties were studied alone against bacteria and with or without the food grade photosensitizer, erythrosine (ERY) against filamentous fungi. Leuconostoc mesenteroides (LM), Bacillus atrophaeus (BA) or Pseudomonas aeruginosa (PA) aliquots were exposed on nutrient agar plates to Array 1 (AR1, 0·2 mW cm(-2)) or Array 2 (AR2, 80 mW cm(-2)), which emitted impure or pure blue light (0-300 J cm(-2)), respectively. Inoculated control (room light only) plates were incubated (48 h) and colonies enumerated.
The antifungal properties of blue light combined with ERY (11·4 and 22·8 µmol l (-1)) on Penicillium digitatum (PD) and Fusarium graminearum (FG) conidia were determined.
Conidial controls consisted of: no light, room light-treated conidia and ERY plus room light. Light-treated (ERY + blue light) conidial samples were exposed only to AR2 (0-100 J cm(-2)), aliquots spread on potato dextrose agar plates, incubated (48 h, 30°C) and colonies counted.
Blue light alone significantly reduced bacterial and FG viability. Combined with ERY, it significantly reduced PD viability. Blue light is lethal to bacteria and filamentous fungi although effectiveness is dependent on light purity, energy levels and microbial genus.

SIGNIFICANCE AND IMPACT OF THE STUDY: Light from two arrays of different blue LEDs significantly reduced bacterial (Leuconostoc mesenteroides, Bacillus atrophaeus and Pseudomonas aeruginosa) viabilities. Significant in vitro viability loss was observed for the filamentous fungi, Penicillium digitatum and Fusarium graminearum when exposed to pure blue light only plus a photosensitizer. F.graminearum viability was significantly reduced by blue light alone. Results suggest that (i) the amount of significant loss in bacterial viability observed for blue light that is pure or with traces of other wavelengths is genus dependent and **(ii) depending on fungal genera, pure blue light is fungicidal with or without a photosensitizer.**