IN VITRO BACTERICIDAL EFFECTS OF 415 NM BLUE LIGHT ON PSEUDOMONAS AERUGINOSA 19660

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INTRODUCTION & PURPOSE

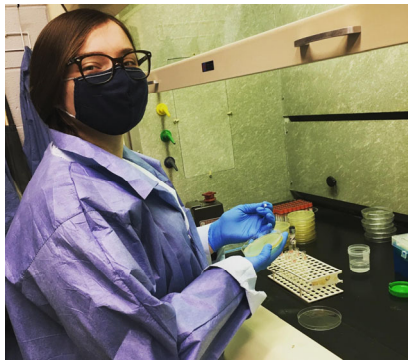
Phototherapy or light therapy can be used to help treat many medical conditions that affect the skin. *Pseudomonas aeruginosa* is a Gram-negative bacilli bacterium. This bacterium is an environmental species and is naturally occurring in water and soil. An opportunistic pathogen, *P. aeruginosa* is a common cause of nosocomial infections. *P. aeruginosa* can also be found in moist areas of clinical settings, such as sinks and respiratory equipment.

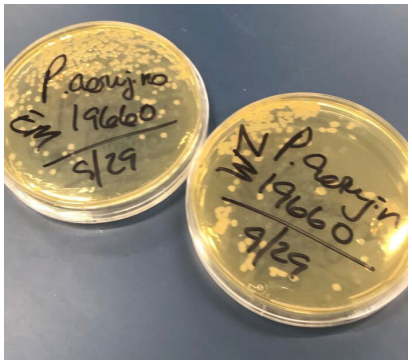
OBJECTIVES

This study is based on the use of blue light therapy to treat burn wound infections.[1] *P. aeruginosa* was tested on brain-heart infusion agar and treated with 415 nm blue light to measure the bactericidal effects of light exposure.

METHODS

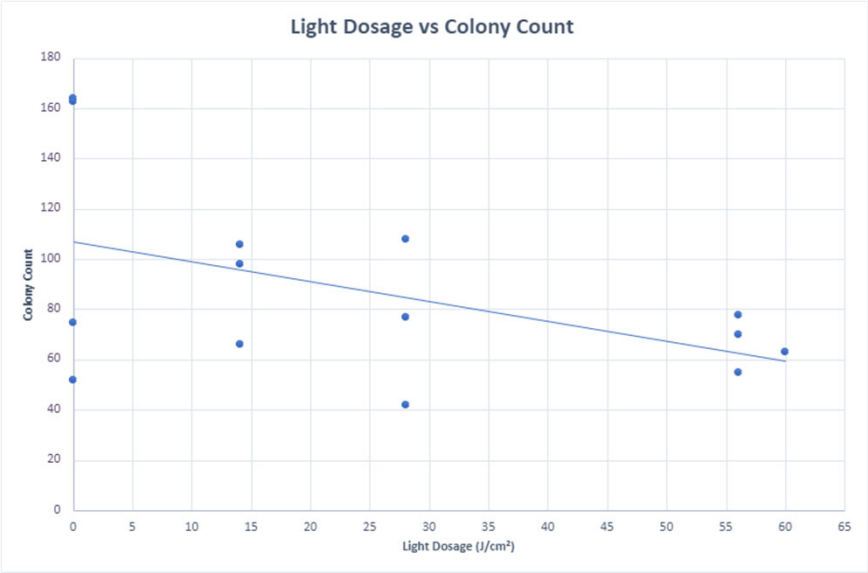
50 uL of *P. aeruginosa* stock (ATCC 19660) was inoculated to 5 mL of brain-heart infusion (BHI) broth and incubated at 37°C for 18-24 hours. The *P. aeruginosa* was then washed and resuspended in phosphate-buffered saline (PBS). This was achieved by centrifuging the broth at 4500 revolutions per minute (RMP) for 10 minutes. The supernatant was removed using sterile pipettes and replaced with 5 mL of PBS. This solution was centrifuged again at the same speed and time, decanted, and replaced with PBS. This solution was resuspended using a vortex. 3 mL of the *P. aeruginosa* solution was pipetted into a small petri dish to be treated with 415 nm blue light. The light therapy doses ranged from 0 J/cm^2 to 60 J/cm^2. Following the blue light exposure, 40 uL aliquots of the treated *P. aeruginosa* solution were transferred to BHI agar plates. These plates were incubated at 37°C for18-24 hours. The *P. aeruginosa* growth was then diluted. This was achieved by making a 0.5 McFarland standard using PBS and treated *P. aeruginosa* colony growth. The 0.5 McFarland solution was diluted to 1/10,000 using a serial dilution. 10 uL aliquots of the diluted solution were inoculated to new BHI agar plates and incubated at 37°C for 18-24 hours. Colony counts were performed following incubation.





FINDINGS

415 nm blue light treatment inhibited in vitro growth of *P. aeruginosa* on BHI agar. The highest dose of light had the greatest effect on bacterial growth.



DISCUSSION & ACTION PLAN

The results of this study are promising for potential in vivo use of blue light therapy to treat wound infections. The next step following this study will be to inoculate the *P. aeruginosa* strain to laboratory rats to measure the rate of burn wound healing in live subjects. *P. aeruginosa* growth was affected by all dosages of light used, but growth of the *P. aeruginosa* was inhibited most by the highest doses of light. The highest dose of light used in this study was 60 J/cm^2 because that is the highest dose of light treatment that is allowed for use on human subjects. The results of this study supported the data from other studies of a similar nature. Studies with similar subjects of experimentation investigated different factors that may affect the degree of bacterial inhibition such as rate of delivery of light and the wavelength of the light used.[4] Other frequencies of light that have been researched range from 405 nm to 880 nm.[2] Previous studies also tested other clinically significant bacterial species. *Staphylococcus aureus,* another common cause of nosocomial infections, was one species that was tested in previous studies.[3] *Propionibacterium acnes*[3] and *Helicobacter pylori*[5] are two bacterial species that are not associated with clinical settings but were also tested using light therapy.

ACKNOWLEDGMENTS

This research was funded by the Use of Photobiomodulation to Treat Infected Wounds grant through the Arkansas Biosciences Institute (ABI). Much thanks to Zachary McClain and Carly Farmer for their support and assistance in this study.

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