CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
J1708

Project Title
Smartphone Heal Thyself: An Inexpensive Bacteria Blasting Attachment

Abstract

Objectives/Goals
The goal of this project is to test the bacteria eliminating ability of a novel smartphone based ultraviolet (UV) sterilizer. Ultraviolet radiation is known to inhibit cell growth and be bactericidal. For these reasons, UV radiation is used as a method to sterilize surgical instruments. The bacteria-killing effects of UV are often dampened by the presence of visible light so isolating the UV segment is an important part of this method. Modern smartphones use an LED-based light for the camera flash that emit both visible and UV light.

Methods/Materials
A filter that blocks visible light and allows UV light to pass was added to a smartphone. The presence of UV rays was confirmed with a UV detector. This experiment was then designed with ten experimental groups. Five control groups of six Petri dishes each were not exposed to any bacteria, and five additional groups consisting of six Petri dishes each were exposed to bacteria. The source of bacteria was oral flora harvested with a cotton-tipped applicator. Within each group of five, one group received no additional intervention, one group was exposed for 10 minutes to a commercial ultraviolet sanitizer expected to eliminate 99.9% of bacteria, one group was exposed to the LED light of a smartphone for 10 minutes, the fourth group exposed to the LED light filtered to allow only the UV light through for 10 minutes, and the final group similarly exposed for 20 minutes. The Petri dishes were then allowed to grow in identical conditions, and underwent a colony count after one week of growth. Following this, a second, identical treatment was performed. A second week was allowed to pass, and the final colony count was performed. The data was recorded, analyzed, and summarized.

Results
The UV detector detected UV radiation for each of the sanitizer, LED alone, and LED with filter. The results from the ten experimental groups showing contrasting outcomes. The control groups with no bacteria applied showed little difference. The treatment groups with UV allowing filter applied for 20 minutes showed comparable results to the commercial UV sterilizer.

Conclusions/Discussion
Smartphone LED lights emit UV radiation capable of bactericidal activity when filtered to eliminate visible light. When used for 20 minutes, there was superior bacterial reduction then even from a commercial UV sanitizer.

Summary Statement
The Ultraviolet portion of smartphone LED lights may be used to sterilize the surface of objects exposed to it providing a simple, inexpensive solution to sterilizing surfaces.

Help Received
My parents helped with the photography and layout of this board. My father also helped with the spreadsheet data. I would like to acknowledge Mrs Eleanor Ludwigsen for loaning me the UV Sterilizer.