



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

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Project Title
Under the Sun: Measuring Ultraviolet Irradiance and Sun Protectant Barriers' Effectiveness in Reducing UV Exposure

Abstract

Objectives/Goals
The objective of this investigation is to evaluate the relationship between the intensity of the sun's Ultraviolet (UVA/UVB) radiation and the most effective sun preventative products required to block UV exposure. A secondary goal is to increase scientific understanding of sun exposure, UV radiation, and make recommendations about precautions that will decrease chances of sun-related health problems like sunburns, eye damage, skin aging, and skin cancer.

Methods/Materials
Using a Digital UV Radiation Indicator, UV irradiance (mW/m^2) with no barriers and directly behind the sun protective barrier item were repeatedly measured for 75 common sun protective products grouped according to specialized use (sunscreens, lip protection, clothing, eye protection, shade coverings, windows/auto glass, hats, and beach equipment). Utilizing two ways of measuring UV light-direct solar radiation and a UVA/UVB emitting Black Light (representing high summer UV index ratings); tests were repeated at three elevations and on clear, sunny, days between 11-2pm. Average UV irradiance, change in UV irradiance, and the percent decrease of UV penetration representing percent effectiveness were calculated.

Results
The results of the data collected showed that overall 47% of all barrier products tested were 100% effective (sunglasses/clothing); 12% of the items (various windows/shade barriers) were above 90% effective; and another 10% were above 80% effectiveness at blocking UV radiation. The charted data showed that the sunscreens and shade barriers were inconsistent at their protection effectiveness-58.9% blocking ability.

Conclusions/Discussion
It is evident that a majority of the common barrier products analyzed for sun protection are highly effective protective barriers. Not only do the direct sun rays have to be blocked by objects before coming into contact with human skin, but the barrier must be used constantly to increase the percentage of protection. Since UV light is most present during the afternoon hours and is strongest during the summer, using any common sun protective products tested will reduce the risks associated with UVA and UVB exposure and future risks of sun-related injuries and diseases. Ultimately, our society needs to become aware of the sun's harmful radiation and what to protect themselves with. In California, the sun shines pretty much every day, so it is important to protect ourselves every day.

Summary Statement
The purpose was to determine the intensity of UV light and the effectiveness of sun protective products ability to protect against harmful UV radiation.

Help Received
7th and 8th grade science teachers for guiding and reviewing my project; my mom for buying the materials and her support, the Synopsys Outreach Foundation for donating the Digital UV indicator.