California Science Center

CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.)
Benjamin C. Steele

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J1033

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)
Sunscreens! The Water Resistance of Ultraviolet Sunscreens

Division
X **Junior (6-8)** _ **Senior (9-12)**

Preferred Category (See page 5 for descriptions.)
10 - Materials Science

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)
Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

I decided to measure sunscreen effectiveness after water exposure. In my research, I found that the SPF number is based on a skin reddening test which measures only UVB protection. Rather than duplicating the SPF UVB testing procedures, I tested UVA protection. There is no standard for UVA protection nor of #water resistance# or #waterproof,# a claim made by all the sunscreens I tested. My results showed that claims of UVA protection and water resistance in current products mean little, and give people a false sense of security in their protection from harmful consequences of UVA sun exposure.

My project had a two-part hypothesis. First, I hypothesized that the SPF rating for the UVB protection would be proportionally linked to the UVA protection factor. Second, I hypothesized that there would be a difference in the effectiveness of different sunscreen brands after being washed, perhaps depending on the type of sunscreen base used, for example, alcohol versus cream based products. To test this, I taped an ultraviolet (UVA) lamp to a can with both ends opened up, and placed a silicon solar cell inside a smaller nesting can, with some fluorescent paper lining that can to increase the output current, since the solar cell is not very sensitive to UV light. I ripped plastic bags open along their seams and put each one between the two cans in turn, using a digital meter to record the amount of UVA passed, as measured by the photocell current. I recorded the UV transmitted with each bag clean, and later, smeared with sunscreen. Then, I washed each of the bags under a steady stream of hot water, and retested all the bags.

I discovered that my first hypothesis was completely incorrect. The best dry sunscreen, with an SPF of 45 for UVB, blocked less than 80% of UVA. This would translate into an SPF rating for UVA of only 5! All of the other the tested sunscreens were significantly worse. The second hypothesis was correct: the water resistance varied greatly among brands, and an alcohol-based product held up to hot water best. Further research would test more products, evaluate the realism of the washing test, and look at more of the UV spectrum.

Summary Statement (In one sentence, state what your project is about.)
My project tested the effectiveness of several sunscreens for UVA protection before and after water exposure.

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.
My brother Quinton helped with washing samples and my father helped solder the leads to the solar cell and with photography.