CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
S1611

Project Title
Bioadhesive Particles Add Durability to Sunblocks and Maintain Efficacy

Abstract

Objectives/Goals
Skin cancer rates continue to rise in America and are primarily due to UV exposure. Zinc oxide was previously found to be the most effective barrier. This experiment evaluates the effectiveness and duration of action of a novel skin protectant product developed from the mixture of Zinc oxide and a bioadhesive. This experiment will employ a common, inexpensive, edible bioadhesive to encapsulate a physical block to create a durable, effective sun protectant.

Methods/Materials
Petri dishes with agar were inoculated with sun sensitive bacteria and allowed to grow for one week in the dark. A colony count was performed and one of the UV protectants was applied. The protected bacteria were then exposed to UV radiation and colony counts of the bacteria were made at seven days following UV exposure. The second stage of the experiment assessed the duration of the protection conferred by measuring UV irradiance with a UV meter hourly under protected pig skin.

Results
In all four treatment groups, bacteria grew as expected prior to colony count I. Groups without the bacteria plated also behaved in the expected fashion with very little bacterial growth and change between colony counts. In the No Protection group, sun exposure produced the expected nearly complete bacterial elimination by the second colony count. In the Zinc oxide group with bacteria and sun exposure, the colony count nearly doubled. The bioadhesive alone did not provide any protection as nearly all of the bacteria died when exposed to the sun. The Zinc oxide plus bioadhesive group demonstrated strong protection of the bacteria as the colony count doubled in the sun exposure experimental group. The data from the irradiance measurements revealed that bioadhesive alone was not protective at all. Zinc oxide was protective for five hours, and then began to lose its shielding effect. The addition of the bioadhesive to Zinc oxide maintained the irradiance below the threshold of 30 W/m2) until the nine hour mark.

Conclusions/Discussion
This project determined that combining the most effective sun protective with a bioadhesive produced a more effective and durable protection. The addition of the bioadhesive allows the product to persist and provide reflectiveness all day. Extending this experiment to cultured human skin will confirm these findings and potentially reduce skin cancer rates.

Summary Statement
A skin protective product made by combining Zinc oxide and a bioadhesive provides effective sun protection and extends the duration of the protection.

Help Received
My parents helped with the photography and layout of this board. My father also helped confirm the bacterial colony counts.