**Introduction**

- Vitamin D is essential for bone health, immunity, mental health, metabolism, and cardiovascular health.
- Vitamin D is primarily acquired in three ways:
  1. Ingestion of vitamin D-enriched foods
  2. Cutaneous synthesis largely due to exposure to sunlight
  3. Synthesis by approximately 97.5% of the body's vitamin D production from UV rays

To combat this problem, a sunscreen was designed with previtamin D, which is formed by a lengthy process by the skin, but can be transferred to vials for HPLC analysis. The specially designed sunscreen with SPF 50 actually results in lower production of vitamin D3 in comparison to the Neutrogena SPF 50 that was two years before its expiration date.

**Methods**

**Irradiation of Ampoules**

1. Borosilicate ampoules were placed over a plastic frame containing three ampoules with 7-DHC on a cold pack.
2. 1.0 mg of 7-DHC was evenly applied to the Borosilicate ampoules with the use of a micro pipette to have 7-DHC directly responsible for the formation of previtamin D3 in the skin.
3. The samples were exposed to a fluorescent UVB emitting lamp for 15 minutes. Many of the ampoules were placed on a cold pack 11.5 minutes after irradiation.

**HPLC Analysis of Ampoules**

1. The samples were placed in a solution of 8% ethyl acetate in hexane.
2. The samples were reconstituted in 0.8% isopropanol in hexane.

**Irradiation of Human Skin**

1. The epidermis was placed in a solution of 8% ethyl acetate in hexane. The samples were exposed to a fluorescent UVB emitting lamp for 15 minutes.
2. The samples were placed in a 50 degrees Celsius water bath overnight.

**Results**

**Ampoules**

1. The specially designed sunscreen with SPF 50 resulted in a production of vitamin D3 that was 30.6% higher than the production of vitamin D3 in the Neutrogena SPF 50.
2. The specially designed sunscreen with SPF 30 resulted in significantly greater production of Vitamin D3 compared to the Neutrogena SPF 50 in testing with ampoules.

**Surgically Obtained Human Skin Samples**

1. The specially designed sunscreen on the production of previtamin D3 in human skin through cutaneous synthesis.
2. The specially designed sunscreen with SPF 30 allowed for a significantly greater amount (64.2%) of production of vitamin D3 than the Neutrogena SPF 30.
3. Figure 7. Production of Vitamin D3 in Irradiated Ampoules. The specially designed sunscreen with SPF 50 resulted in a production of vitamin D3 that was 30.6% higher than the production of vitamin D3 in the Neutrogena SPF 50.
4. The specially designed sunscreen on the production of vitamin D3 in surgically obtained human skin samples was evaluated and compared to commercial Neutrogena sunscreen at SPF 30 and SPF 50.

**Discussion**

1. It was found that both types of sunscreen significantly reduced vitamin D3 production in amphibious and human skin. This finding has broad implications, as the use of sunscreen can be taken widely advocated to protect the skin from harmful UV radiation.
2. Testing in amphibious samples showed that the specially designed sunscreen on SPF 50 compared to the Neutrogena sunscreen at SPF 30.
3. A comparison of the Neutrogena SPF 50 sunscreens demonstrated that the two-year old Neutrogena SPF 50 sunscreen resulted in a production of vitamin D3 that was 30.6% higher than the production of vitamin D3 in the new Neutrogena SPF 50.
4. The two-year old Neutrogena SPF 50 sunscreen therefore exhibited a lower SPF than the one-year old Neutrogena SPF 50 sunscreen.

**Conclusions**

- All sunscreens significantly lowered vitamin D3 production.
- The specially designed sunscreen with SPF 30 allowed for a significantly greater amount (64.2%) of production of vitamin D3 than the Neutrogena SPF 30 in testing with amphipods.
- However, the specially designed sunscreen with SPF 50 did not result in a statistically significant difference in production of vitamin D3 compared to the Neutrogena sunscreen in both amphibious and skin samples.
- In skin samples, application of the specially designed SPF 50 and SPF 30 sunscreen resulted in a lower level of vitamin D3 production than application of Neutrogena SPF 50 and SPF 30 sunscreen did.

**References**


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**Table 1**

<table>
<thead>
<tr>
<th>Sunscreen Type</th>
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<th>SPF 30</th>
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<tbody>
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<td>Product 2</td>
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<td>Product 3</td>
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Table showing the comparison of different sunscreen types for SPF 50 and SPF 30.