Improving Sun Protection

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Improving Sun Protection

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Age-Adjusted Melanoma Incidence and Projection
NIH data
Sunscreen protects only at wavelengths less than 370 nm. 

Image credit: Skin Cancer Foundation
Inadequacy of Sunscreen
(Liebel, Kaur, Ruvolo 2012)

- Sunscreens do not absorb ultraviolet A1 (UVA1) and visible light (VL)
- UVA1 and visible light induce
  - Erythema (redness/burns)
  - Pigmentation (tanning)
  - Reactive oxygen species (ROS)
  - Extracellular Matrix-degrading enzymes
Antioxidants
(Denat, Kadekaro, Marot 2014) (Pelle, Mammone, Marenus 2003)

• UVA1 + VL $\rightarrow$ ROS $\rightarrow$ pigmentation
• Antioxidants quench ROS
• Antioxidants mitigate VL induced ROS and photooxidative damage
• Hypothesis: A topical antioxidant product will mitigate VL-induced pigmentation
Methods

• Antioxidant complex: DESM, tocopherol, ascorbic acid
• 10 subjects of skin phototypes IV-VI
• Subjects’ backs received 320 J/cm² of VL and UVA1
• Sites with 0.5%, 1%, and 2% antioxidant were compared with untreated control
Assessments

- Spectrophotometer measured skin color after irradiation and 7 days later
- Immediate pigment darkening: lasts minutes, caused by melanin oxidation and redistribution
- Delayed tanning: lasts days, caused by new melanin synthesis
Results: Spectrophotometry Data

Day 0

Day 7

$p=0.07$
Results

• Every subject developed pigmentation at all irradiated sites
• Immediately after irradiation, 2% antioxidant sites were significantly less pigmented
• A week later, 2% antioxidant sites were still less pigmented, but this difference did not reach significance
Discussion

• Results support hypothesis and further investigation is warranted

• Topical antioxidants can mitigate VL-induced pigmentation

• Future studies
  o Can antioxidants prevent sunburn in lighter-skinned subjects?
  o Molecular assays to quantity ROS generation