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Medical Education Research Forum 2019

5-2019

Improving Sun Protection

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Recommended Citation

Zubair, Raheel; Kohli, Indermeet; Lyons, Alexis B.; Nahhas, Amanda F.; Braunberger, Taylor L.; Moktari, Mohsen; Ruvolo, Eduardo; Lim, Henry W.; and Hamzavi, Iltefat H., "Improving Sun Protection" (2019). *Clinical Research*. 3.

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Improving Sun Protection

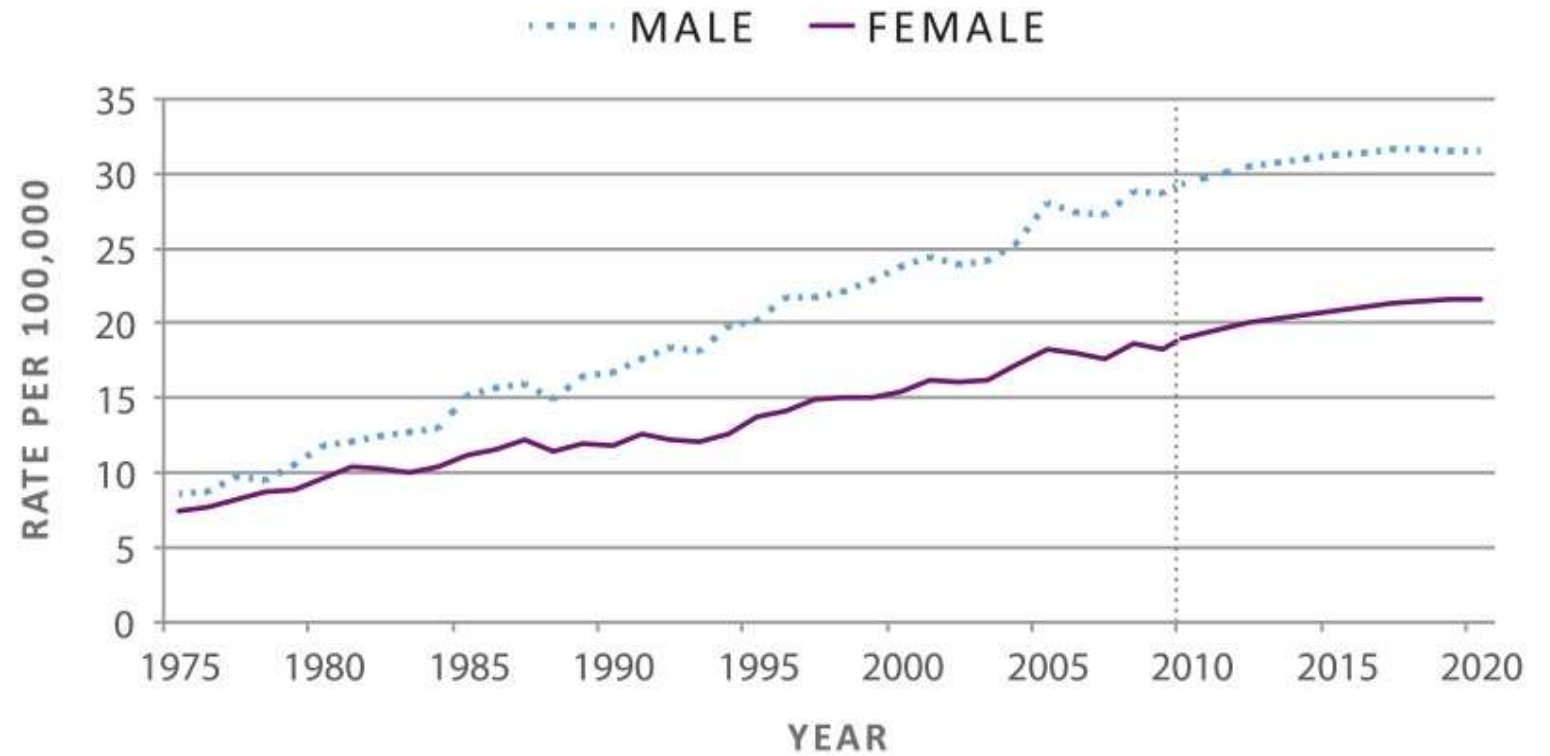
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Disclosure: This study was sponsored by Bayer

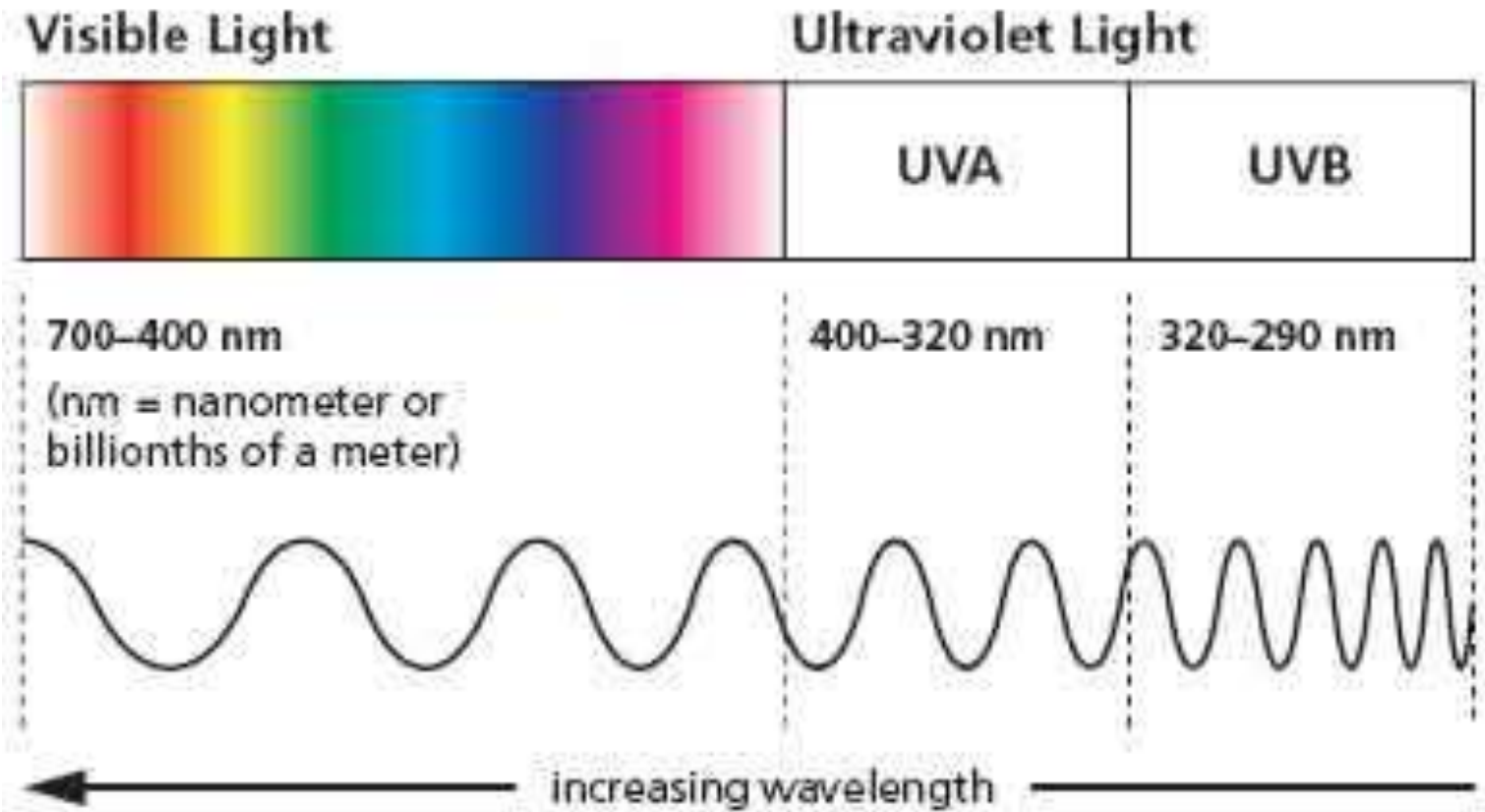


**The
Problem
with
Sunscreen**

Age-Adjusted Melanoma Incidence and Projection
NIH data



Visible Light/UV



Sunscreens
only protect
 $\lambda < 370\text{nm}$

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 → ROS → pigmentation
- Antioxidants quench ROS
- Antioxidants mitigate VL induced ROS and photooxidative damage
- *Hypothesis:* A topical antioxidant product will mitigate VL-induced pigmentation



Methods

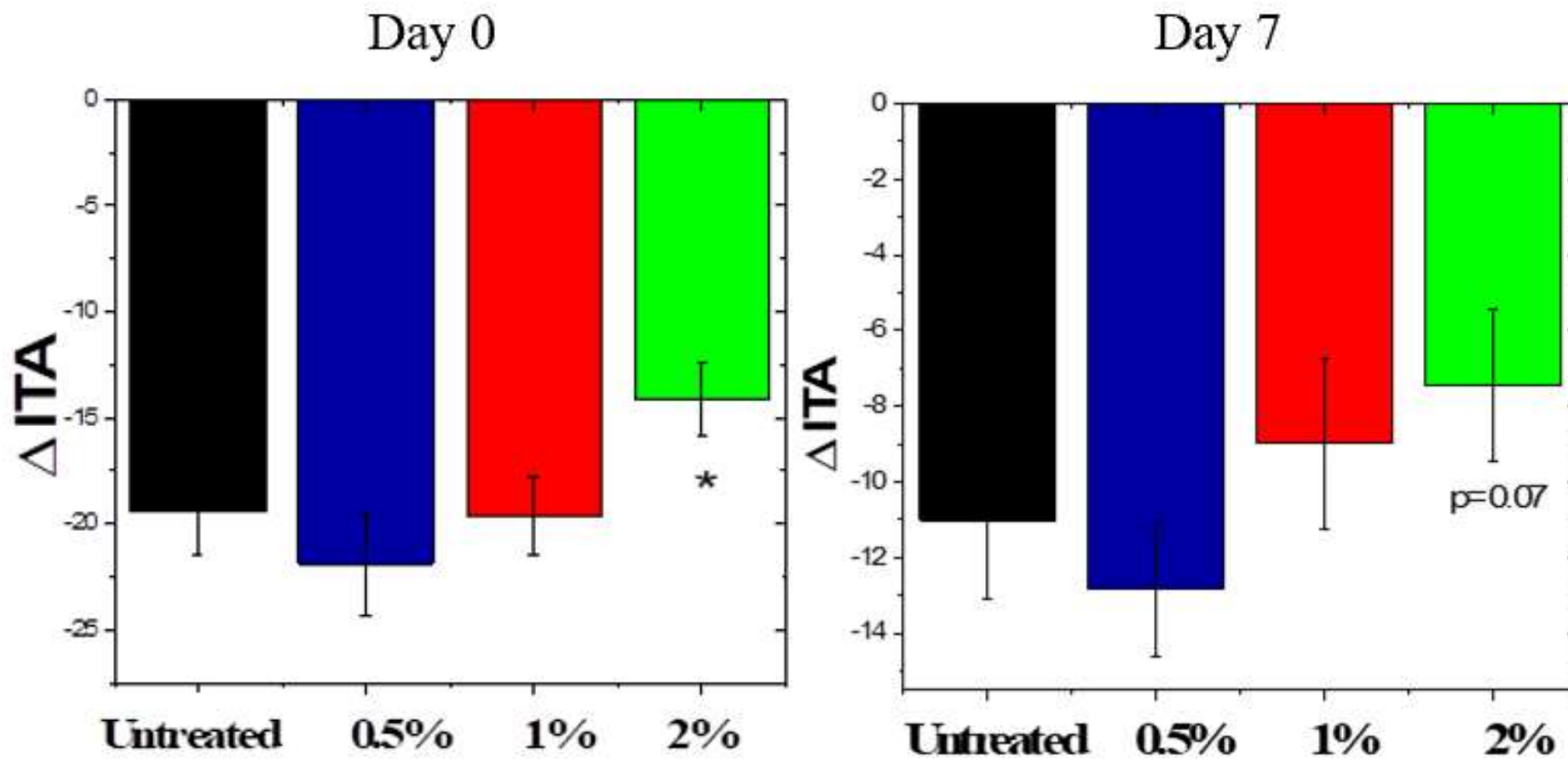
- **Antioxidant complex: DESM, tocopherol, ascorbic acid**
- **10 subjects of skin phototypes IV-VI**
- **Subjects' backs received 320 J/cm² of VL and UVA1**
- **Sites with 0.5%, 1%, and 2% antioxidant were compared with untreated control**

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



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
 - Can antioxidants prevent sunburn in lighter-skinned subjects?
 - Molecular assays to quantify ROS generation