

NATIONAL DERMATOLOGY RESIDENT LECTURE SERIES SUMMARY

Lecture: The Truths and Myths of Photoprotection by Dr. Harvey Lui

Date: April 28, 2020 via Zoom

Compiled by: Ilya Mukovozov, PGY2, University of British Columbia

The Yin and Yang of Light in Dermatology

- Bad: skin cancer, photoaging, photodermatoses
- Good: phototherapy, lasers, photodynamic therapy

Sunscreen and Melanin

- Regular use prevents sunburns, actinic keratoses, squamous cell carcinomas, melanomas, photoaging, photodermatoses
 - However, there is no concrete evidence sunscreen decreases risk of basal cell carcinoma
- Melanin is protective, but can also be harmful
 - Good: absorbs photons during sun exposure, protects skin from direct UV damage to DNA
 - Bad: photon energy absorbed by melanin → melanin degradation products → delayed DNA damage

Common Myths and Clinical Implications

- “Make sure you apply sunscreen...”
 - This does not apply to everyone. Melanin is our ‘natural sunscreen’ and individuals with darker skin phototypes have more melanin, therefore, unlikely to need sunscreen as much as individuals with lighter skin but note above
 - Dr. Adewole Adamson in the Washington Post – Dark skinned people can get skin cancer, but sunscreens won’t help (no protective role shown)
 - NB: sunscreen literature based mostly on studies done in Caucasians
- “Apply sunscreen 30 minutes BEFORE you go outside...”
 - Based on old sunscreen formulations requiring time for skin absorption, but this is now an obsolete requirement more or less
 - Clinical relevance as patients may forgo applying any sunscreen at all as they “missed” the 30 minute window
- “Re-apply your sunscreen every 2 to 3 hours...”
 - Only reapply if bathing, or excessive sweating, otherwise you’re still protected with the layer applied previously
- “There are two types of sunscreens, physical (ZnO, TiO₂) and chemical. Chemical sunscreens absorb UV and physical sunscreens block UV...”
 - Sunscreens are classified can as organic (carbon-based) vs. inorganic (metal based) and soluble vs. insoluble, NOT as physical vs. chemical
 - All sunscreen ingredients filter light by physical processes (absorption, reflection)
 - Inorganic metal oxides (TiO₂, ZnO) mostly absorb UV and reflect visible light (VIS)
- “Sunscreens with SPF > 30 are unnecessary...”
 - Only true in theory as most individuals apply only ¼ to ½ of the required sunscreen, therefore divide SPF by 2 or 4, so practically, if start with 60, you only get a 15-30 due to lighter application
 - Sunscreen density (FDA mandated) = 2 mg/cm² to reflect true SPF with application

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Sunscreen Challenges

- Consumer Fear
 - Aversion to “chemicals”, estrogenic effects of benzophenone, retinyl esters and cancer, nanoparticle absorption, vitamin D inhibition, contact allergy, safety in children, environmental effects
 - There is absorption of sunscreen into blood: 2019 study in JAMA showed that application of commercially available sunscreens (spray, lotion and cream formulations) resulted in plasma concentrations exceeding the FDA-established thresholds for systemic absorption (1.8-4.0 ng/mL)
 - Sunscreens do not need to be absorbed into the skin; SPREAD, but do not “rub in” the sunscreen
 - Sunscreen safety: “GRASE” – generally recognized as safe and effective
 - GRASE for use in sunscreens: zinc oxide (ZnO), titanium dioxide (TiO₂)
 - NOT GRASE in sunscreens: aminobenzoic acid (PABA), trolamine salicylate
 - Insufficient data: all other ingredients
- Others: improper use (insufficient amount, incomplete coverage), expense

Other Learning Points

- Solar energy: 7% UV (causes all the harm), 39% VIS, 54% infrared (warmth)
 - Currently, sunscreens filter UV well, but do not filter VIS and infrared...room for improvement
- Photoprotection beyond sunscreens: remember to seek shade, hats, sunglasses
- Vitamin D is light sensitive; UV degrades excess Vitamin D made in the skin
- Generally: tinted products work as well to a degree, spray-on products theoretically as effective if applied the same way, but practically easier and more expensive