# Sunscreens and Health

Henry W. Lim, MD
Department of Dermatology
Henry Ford Health System
Detroit, Michigan, USA

# Disclosures

- *Investigator:*
  - Incyte
  - L'Oréal
  - Pfizer
  - PCORI

# Disclosures

- Consultant:
  - Pierre Fabre
  - ISDIN
  - Ferndale
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- Speaker, educational session:
  - La Roche-Posay
  - Cantabria labs

# Photoprotection

- Seek shade
- Wear photoprotective clothing, wide brimmed hat, and sunglasses
- On otherwise exposed areas: Apply SPF>30, broad spectrum, tinted sunscreens

# Ultraviolet Radiation

| UV | Wavelength (nm) | Comment |
|---|---|---|
| UVC | 200-290 | Germicidal.<br>Does not reach the surface of the earth |
| UVB | 290-320 | Sunburn, skin cancer |
| UVA | 320-400 | Tanning, wrinkles, skin cancer |

# Sunscreen Active Ingredients: UV Filters

- Organic (chemical) filters:
  - UVB filters
  - UVA filters: in the US, only a few (eg, avobenzone, oxybenzone)
- Inorganic (mineral) filters:
  - Zinc oxide
  - Titanium dioxide

# Sunscreen Active Ingredients: UV Filters

## Organic (chemical) filters:

- Transparent – good cosmesis and consumers' acceptance
- Many had percutaneous absorption
  - Clinical significance is unclear
- Some bleach coral reef in laboratory settings (at high concentration)

# Sunscreen Active Ingredients: UV Filters

## Inorganic (mineral) filters:

- Frequently combined with organic filters to achieve higher SPF
- Considered to be safe and effective by the FDA
- Not as efficient as organic filters (FDA allows max conc at 25%)
- Used in nanonized form
  - Aggregation causes whitish residue on skin – not well accepted by dark skinned individuals

# Sunscreens and Health

- Actinic keratoses (precancerous skin lesions, induced by sunlight)
- Skin cancers: squamous cell carcinoma, basal cell carcinoma, melanoma
- Internal diseases
- Vitamin D
- People with dark skin

# Sunscreens and Health

- **Actinic keratoses** (precancerous skin lesions, induced by sunlight)

# Sunscreens and Actinic Keratoses

*(Thompson SC. N Engl J Med 1993; 329:1147. Australia*
*Naylor, MF. Arch Dermatol 1995; 131:170. USA.*
*Darlington S. Arch Dermatol 2003; 139:451. Queensland, Australia)*

- **The use of broad spectrum sunscreens (15+ - 29) resulted in a decrease in the development of actinic keratoses**

# Sunscreens and Health

- Actinic keratoses (precancerous skin lesions, induced by sunlight)
- Skin cancers: squamous cell carcinoma, basal cell carcinoma, melanoma

# Sunscreens and Skin Cancers

*(Green, A., Lancet 1999; 354:723.*
*van der Pols, JC,…. Green, A. Cancer Epidemiol Biomarkers Prev 12/2006; 15:2546.*
*Brisbane, Australia)*

- A 4.5 yr + 8 yr f/u study of 1621 residents of Nambour, Queensland, randomly assigned to daily SPF16 broad spectrum sunscreen group, vs. control.
- Squamous cell carcinoma incidence rates: significantly decreased by 38%
- Basal cell carcinoma incidence rates: decreased by 25%, but did not reach statistical significant

# Sunscreens and Melanoma

*(Green, A., J Clin Oncol. 2011 Jan 20;29(3):257-63. Brisbane, Australia)*

- 1992-1996: 1621 residents of Nambour, Queensland, randomly assigned to daily SPF16 broad spectrum sunscreen group + 30 mg beta-carotene daily, vs. control.
- 2006 (10 yrs later):
  - Melanoma: 11 in tx gr; 22 in control
  - Invasive melanoma: 3 in tx gr, 11 in control.
- Melanoma may be prevented by sunscreen use

# Sunscreens and Photoaging

*(Hughes, MCB…. Green, AC. Ann Intern Med 6/13; 158:781 Brisbane, Australia)*

- 903 adults <55 yo
- Daily sunscreen (SPF15+; cinoxate + avobenzone) gr, vs discretionary sunscreen gr
- 1992-1996 (4.5 yrs)
- Photoaging assessed by silicone-based impression material on back of hand.

# Sunscreens and Photoaging

*(Hughes, MCB…. Green, AC. Ann Intern Med 6/13; 158:781 Brisbane, Australia)*

- Sunscreen group:
  - No detectable increase in skin aging
- Skin aging in daily sunscreen group was 24% less than the discretionary sunscreen group.

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# UV Filters and Human Health

*(Suh, S, … Smith, J, Meshinkovska, N. Int J Dermatol 2020 Sept; 59:1033. UC Irvine)*

- Systematic review. 29 studies
- Oxybenzone:
  - No adverse effect on male and female fertility, female reproductive hormone level, adiposity, fetal growth, child's neurodevelopment, and sexual maturation.
  - Association of oxybenzone level on thyroid hormone, testosterone level, kidney function, and pubertal timing has been reported → should be investigated to validate a true association.

# UV Filters and Human Health

*(Suh, S, … Smith, J, Meshinkovska, N. Int J Dermatol 2020 Sept; 59:1033. UC Irvine)*

- **Octinoxate:**
  - **No reported effect on thyroid and reproductive hormone levels**
- **Conclusion: Current evidence is *not* sufficient to support the causal relationship between the elevated systemic level of oxybenzone or octinoxate and adverse health outcomes.**

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- **Vitamin D**

# Sunscreen Use and Vitamin D

*(Norval, M, Wulf, HC. Br J Dermatol 10/09; 161:732. Edinburg and Copenhagen)*

- Reviewed published evidence
- Conclusion: While sunscreens can significantly reduce the production of vit D under very strictly controlled conditions, their *normal usage does not generally result in vit D insufficiency*

# Sunscreen Use and Vitamin D

*(Passeron, T, et al. Br J Dermatol 2019 Nov;181:916)*

- Reviewed published evidence by 13 international experts
- Conclusion:
  - Sunscreen use does not compromise vitamin D synthesis
  - Rigorous photoprotection (clothing, shade-seeking, and sunscreen): likely to compromise vitamin D status.

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# Sunlight Reaching the Earth's Surface at Sea Level

- Approximately 5% UV (280-400 nm), and 50% visible light (VL; 400-700 nm)
  - VL: for general illumination
- VL + UVA1 induce intense and long-lasting pigmentation on dark-skinned, but not in light-skinned individuals
  - *Mahmoud, BH, et al. J Invest Dermatol 8/10; 130:2092*
  - *Kohli, I, et al. Br J Dermatol 2018 May; 178:1173*

# Clinical Implications

- Visible light + UVA1 may have a role on conditions aggravated by sun exposure such as post-inflammatory hyperpigmentation and melasma, conditions commonly seen in dark-skinned individuals.
- Currently available UV filters are not sufficient to protect the skin from the effect of VL.
- Tinted sunscreens (containing iron oxides) need to be used.

# Sunscreens and Health

- Overview of photoprotection and UV filters

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