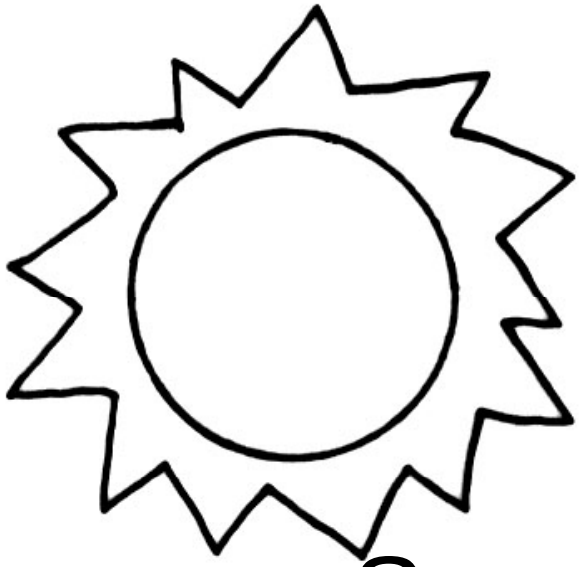

Sunscreen

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HAWAIIAN
Tropic
Dark
Tanning
Oil
Original
A RARE BLEND OF
NATURE'S RICH TANNING OILS
MOISTURIZING
8 FL OZ (237 ml)
HONOLULU, HAWAII
TANNING RESEARCH LABS, INC.

Outline

1. Reasons for using sunscreen
2. Health care of sunscreen
3. Active ingredients of sunscreen
4. Grading system of sunscreen
5. Conclusion

Ultraviolet (UV)

- Electromagnetic radiation with wavelength ranges from 10 to 400nm
- Bands: UVA, UVB and UVC
- 98.7% of UV radiation is blocked by the atmosphere’s ozone layer

Prolonged exposure to UV

- As a defense against UV radiation, the amount of the brown pigment melanin in the skin increases when exposed to moderate (depending on skin type) levels of radiation; this is commonly known as a sun tan. The purpose of melanin is to absorb UV radiation and dissipate the energy as harmless heat, blocking the UV from damaging skin tissue.

Effect of UVB

- UVB yields a tan that takes roughly 2 days to develop because it stimulates the body to produce more melanin
- UVB can cause erythema (sunburn)
- basal and squamous cell carcinomas are predominantly a result of direct damage to the DNA by interaction with UVB (solar wavelengths 280-320 nm)

Effect of UVA

- UVA (320-400nm) gives a quick tan that lasts for days by oxidizing melanin that was already present and triggers the release of the melanin from melanocytes
- UVA interacts indirectly with the DNA by producing free radicals and reactive oxygen species (ROS) leading to DNA, cell and tissue damage
- causes skin premature aging and increase the rate of melanoma

Sunscreen

- Sunscreen is a lotion, spray, gel or other topical product that absorbs or reflects sun's UV
- Primarily designed to prevent UVB associated burning and damages
- The increasingly recognized role of UVA in aging, and possibly melanoma, highlights the need to include UVA screens

Category of sunscreen products

- Chemical absorbers
- usually aromatic molecules conjugated with carbonyl groups
- structure can absorb high-energy UV rays
- excited to a higher energy state
- then release lower energy wavelength radiation
- thus preventing UV from reaching the skin

Chemical	UVB	UVA II	UVA I
	(290-320nm)	(320-340nm)	(340-400nm)
Aminobenzoic acid derivatives			
PABA	Partial	None	None
Glyceryl PABA	Partial	None	None
Padimate O	Partial	None	None
Roxadimate	Complete	Partial	None
Benzophenones			
Dioxybenzone	Complete	Complete	Partial
Oxybenzone	Complete	Complete	Partial
Sulisonbenzone	Complete	Complete	Partial
Cinnamates			
Octocrylene	Complete	Complete	Partial
Octyl methoxycinnamate	Complete	None	None
Salicylates			
Homosalate	Partial	None	None
Ethylhexyl salicylate	Complete	None	None
Trolamine salicylate	Complete	None	None

Category of sunscreen products

- Physical blockers
- reflect or scatter UV radiation
- act on all wavelengths of UV radiation
- common active ingredients are titanium dioxide and zinc oxide

Measurement of sunscreen protection

1. UVB - Sun Protection Factor (SPF)
2. UVA – PPD, PA(+) and Boot’s Star

Sun Protection Factor (SPF)

- the amount of UV radiation required to cause sunburn on skin with the sunscreen on, relative to the amount required without the sunscreen
- Dosage in laboratory tesing: 2mg/cm2
- Exponential correlation with SPF

Sun Protection Factor (SPF)

Sun Protection Factor	Proportion of UVB blocked
SPF 10	90.00%
SPF 15	93.00%
SPF 20	95.00%
SPF 30	96.70%
SPF 50+	>98.30%

Sun Protection Factor (SPF)

- factors affected the effectiveness of a sunscreen

1. The skin type of the user.
2. The amount applied and frequency of re-application.
3. Activities in which one engages.
4. Time of day and season.
5. Percentage of UV reflected or scattered by the environment.
6. Amount of sunscreen the skin has absorbed

Persistent Pigment Darkening (PPD)

- a method of measuring UVA protection, similar to the SPF method of measuring UVB light protection
- Instead of measuring reddening of the skin, the PPD method uses UVA radiation to cause a persistent darkening or tanning of the skin

Japanese measurement of UVA protection

- PA (+) - Japanese measurement of UVA protection: PA stands for Protection grade of UVA.
- The PPD method with its classification PA+, PA++, PA+++ is popular all over Asia.

PA vs PPD

PA	PPD	Protection level
PA+	PPD 2-4	Low
PA++	PPD 4-6	Moderate
PA+++	PPD 6-8	High

Boots Star Rating System (UK)

- The sunscreen manufacturer and retailer Boots developed and enforced the Boots Star Rating System based on Diffey's UVA/UVB ratio.
- The criterion for the recently introduced 5-star rating, given by a UVA/UVB ratio > 0.91, comes closest to uniform UV protection.

Boots Star Rating System (UK)

UVA/UVB	0 to 0.2	0.21 to 0.4	0.41 to 0.6	0.61 to 0.8	0.81 to 0.9	> 0.91
Boots Stars	None	*	**	***	****	*****
Catagory	none	Minimum	Moderate	Good	Superior	Ultra

Reminders of using sunscreen

- The activities that you're going
- The dosage applied
- Frequency of reapplicaiton
- Higher SPF and PPD is usually preferable

Conclusion

- Protect your skin from harmful UV by picking the right sunscreen
- Use the sunscreen correctly for better protection
- Physical blockers are better choices though it has poorer cosmetic appearance
- A better UVA grading system will help us to choose a better sunscreen

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Q & A