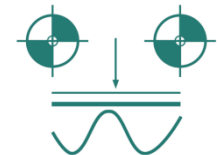


Characterization of Fitzpatrick Skin Types I-III for UV Tolerance & Extrinsic Aging Using Classical and Computer Generated Modalities

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Clinical Research Labs, LLC
Piscataway, NJ



Fitzpatrick Skin Type Scale

- Established in 1975 (Harvard)
- Qualitative assessment of burn potential/solar tolerance
- Semi-quantitative-Self assessment techniques
- Alternate to using ITA value

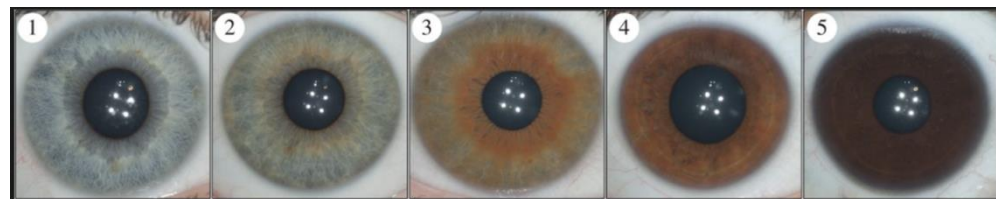
Fitzpatrick Scale



Relevance:

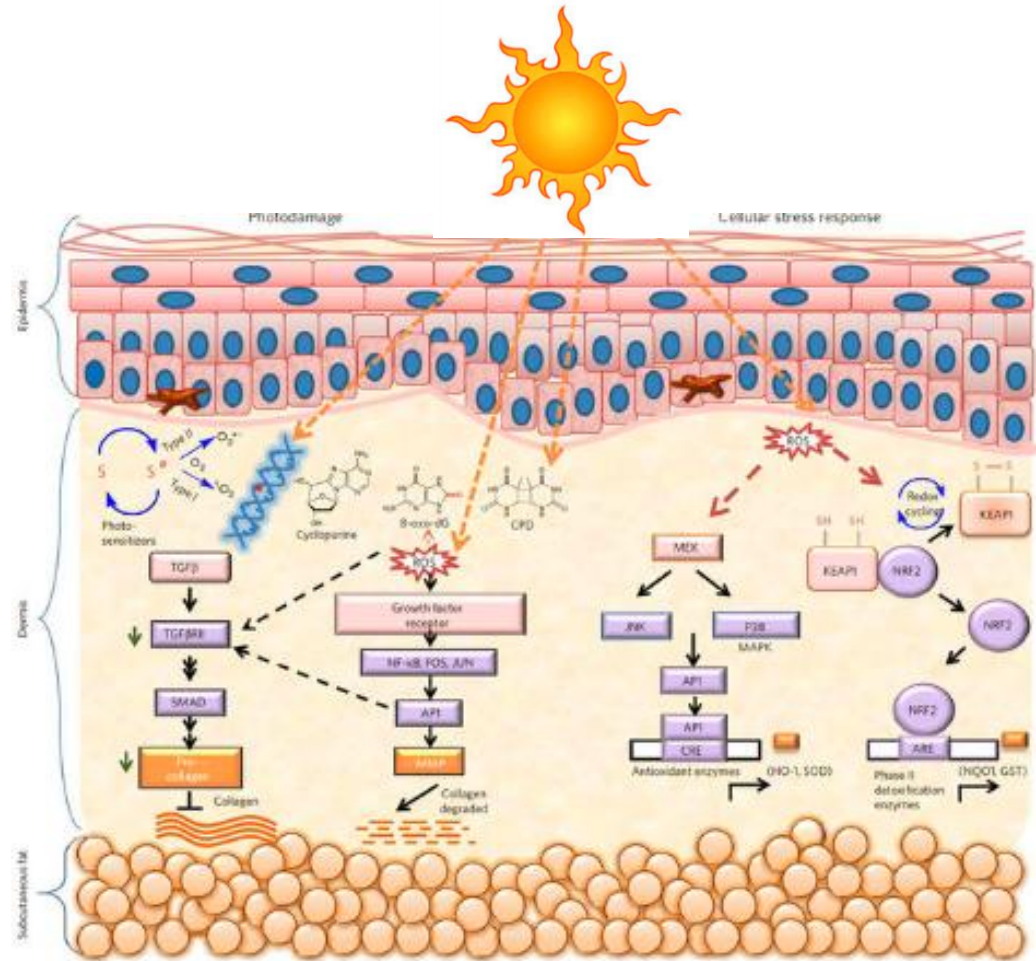
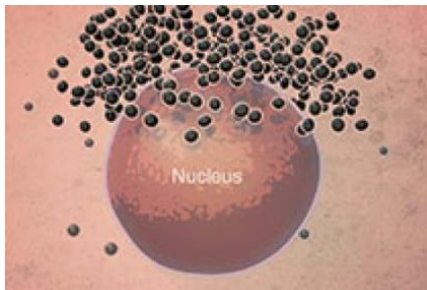
Predisposition to pathology
Risk factors to treatments
R&D/claims support/Safety

- Product development
- Antiaging
- Photobiology
- Nutraceutical
- Safety in use recommendations



Solar Influence on Skin Biology "It's More Than Just the Burn"

- Pigmentation
- ROS generation
- Vitamin D production
- Inflammation
- Matrix degradation
- Solar elastosis
- Hyperproliferation
- Post-Inflammatory Hyperpigmentation
- DNA Damage
- Immunosuppression



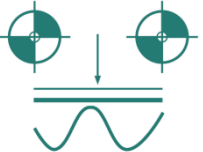
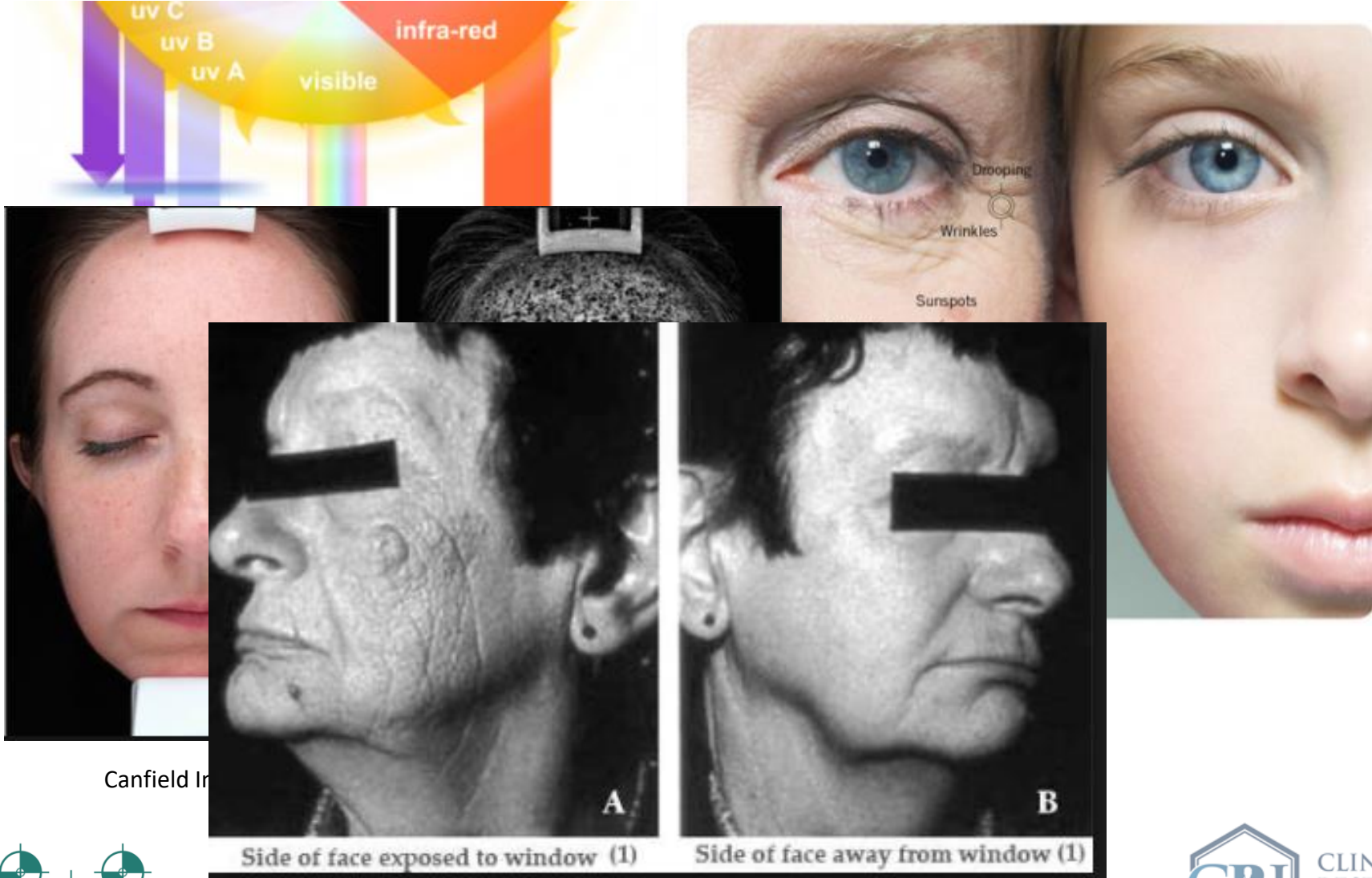
Nature Chemical Biology volume 10, pages 542–551 (2014)



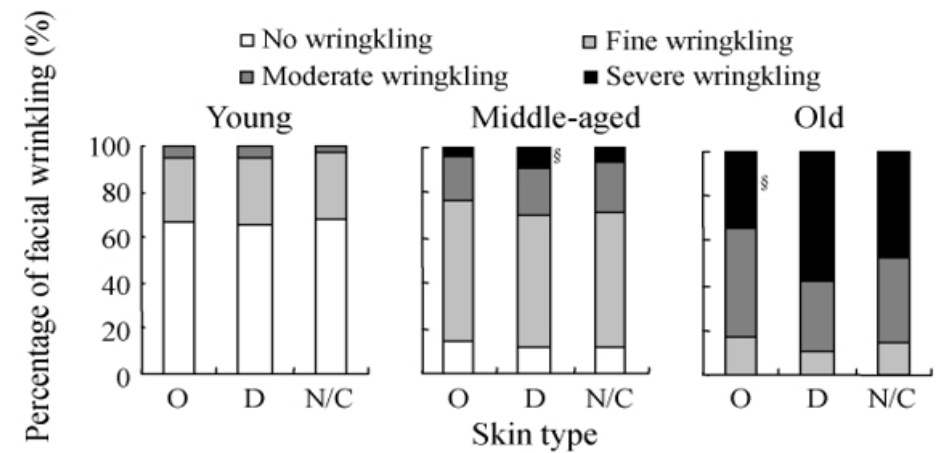
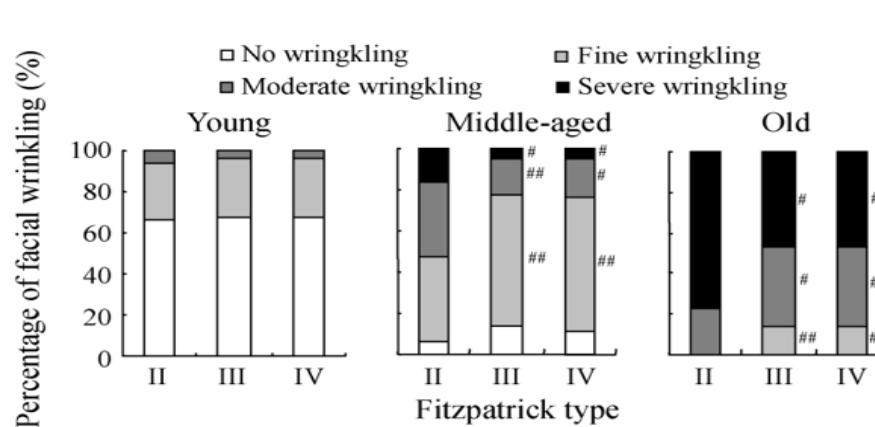
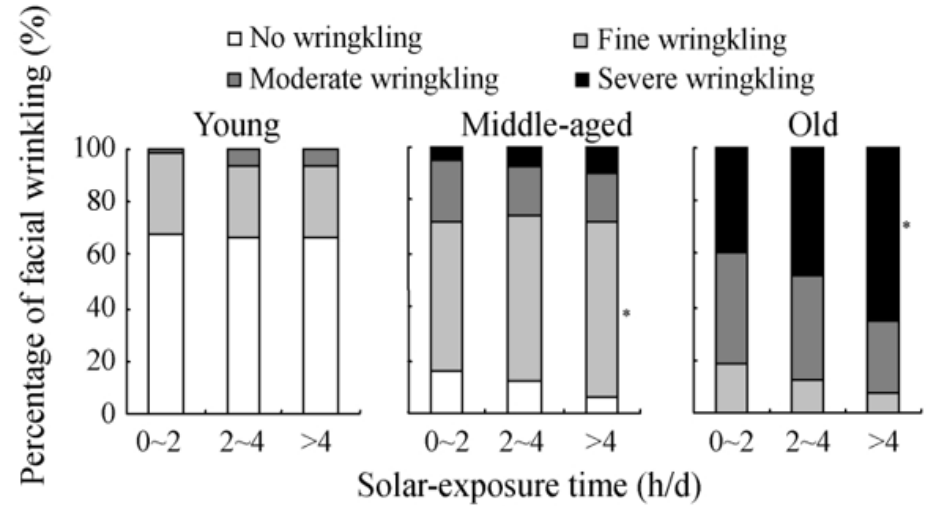
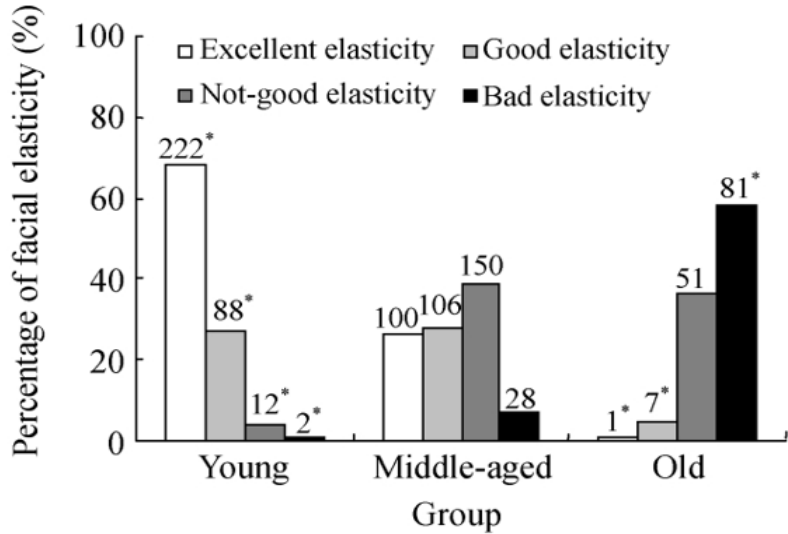
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Solar Influence on Skin Biology "It's More Than Just the Burn"



Age, Cumulative Solar Exposure and Genetic Predisposition are the Associated Forces in Promoting Skin Aging



Wang et al. / J Zhejiang Univ Sci B 2009 10(1):57-66

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Gather, Track & Correlate Fitzpatrick Skin Types I-III Information to Better Characterize and Follow Study Populations in NJ

Models and Methods:

Fitzpatrick Skin Type Burn Analysis:

- 233 Subjects were evaluated from the CRL data base with informed consent.
- Demographics include Fitzpatrick skin type, gender and age.
- Fitzpatrick skin type determined by questionnaire data collected on self perceived ability to burn vs. tan with no sunscreen along with eye and hair color.
- UV burn times equal to 1 MED were applied using a fixed emission source single port/multi port solar simulator(Solar Light™) on healthy good condition backs of subjects. Energy output of $210 \text{ J/cm}^2 = 1\text{MED}$.
- UV exposure time were matched to subjects Fitzpatrick determination. Comparisons among the three Fitzpatrick skin types were made using ANCOVA (age as covariate).



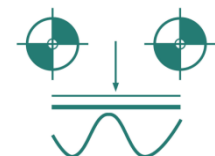
Fitzpatrick Skin Types I-III Show Significant Differences in Burn Times (MED) as they Relate to UV Exposure Times

Fitz Skin Type I Exposure Time	Frequency	Fitz Skin Type II Exposure Time	Frequency	Fitz Skin Type III Exposure Time	Frequency
10	7	10	8	10	2
13	15	13	36	13	5
16	8	16	38	16	9
20	3	20	0	20	29
25	2	25	13	25	17
		31	1	31	13
				39	3

Comparison among three Fitzpatrick skin types using ANCOVA (age as covariate)			
MED (seconds)	I	II	III
I		0.0232	<.0001
II	0.0232		<.0001
III	<.0001	<.0001	

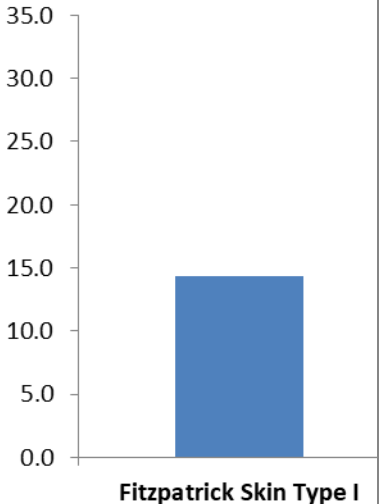
Fitzpatrick Skin Type	Sample size
I	35
II	120
III	78

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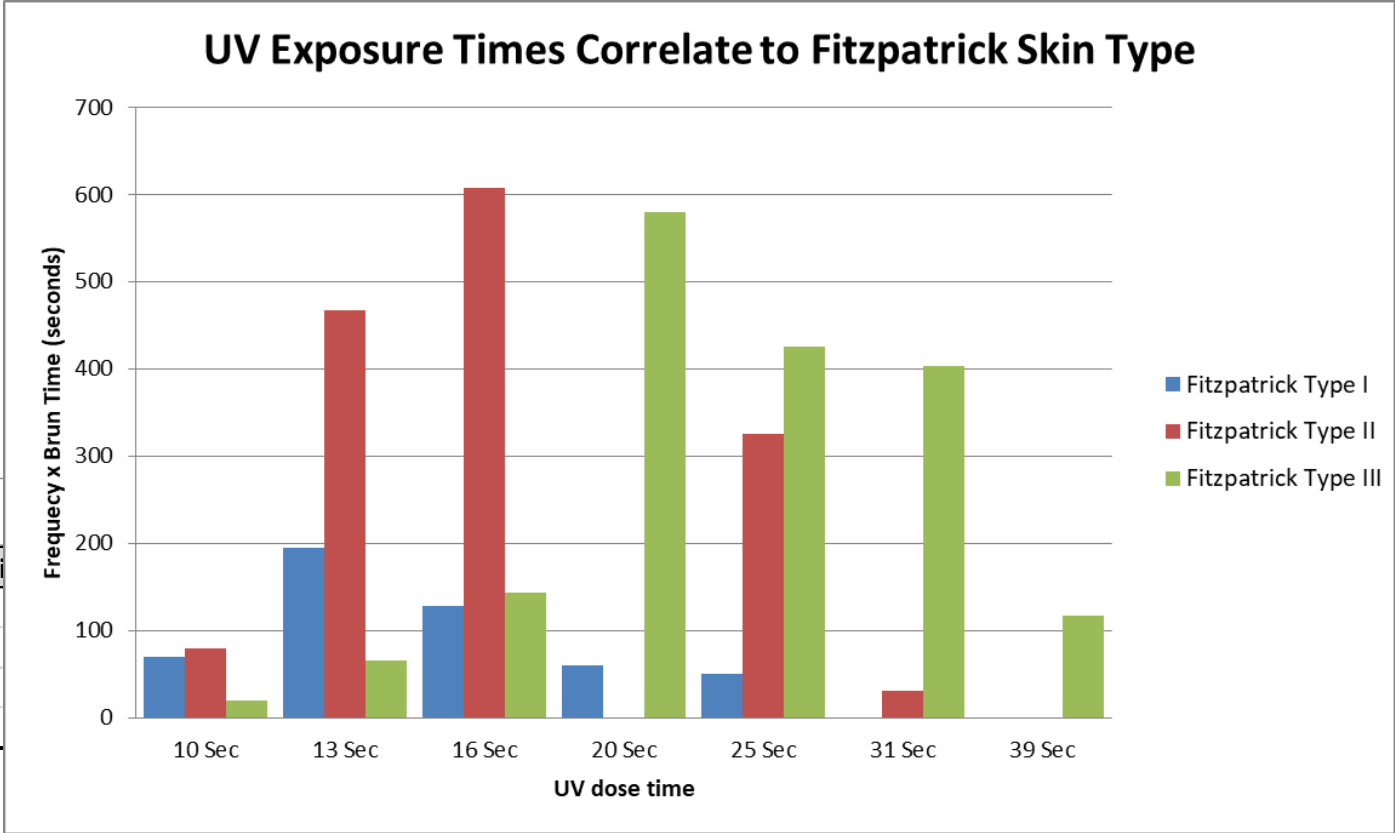
Fitzpatrick Skin Types I-III Show Significant Differences in Burn Times (MED) as they Relate to UV Exposure Times

Avg Burn Time (sec) For Lighter Fitzpatrick Skin Types I-III



UV Burn Time	Fitzpatrick Skin Type
Avg (Sec)	14.4
Std dv (Sec)	3.9
min Range (Sec)	10.5
Max Range (Sec)	18.2

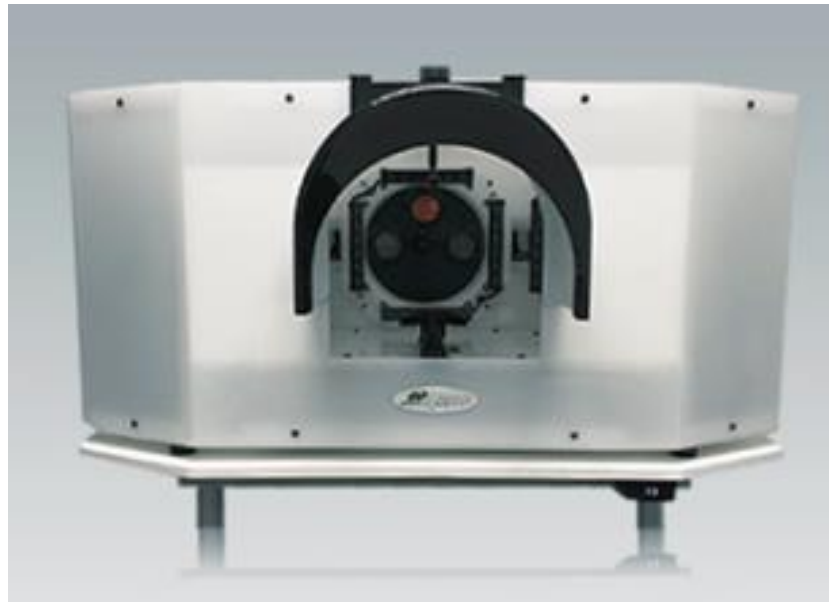
UV Exposure Times Correlate to Fitzpatrick Skin Type



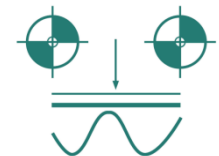
Gather Fitzpatrick Skin Types I-III Information to Correlate to Aging Characteristics around the Eye (Crow's Feet)

Models and Methods:

- 68 BTBP CLARITY™ 3D System Images were analyzed on representative subsets of each Fitzpatrick skin type use in the previous analysis focusing on the lateral eye areas (Crow's feet), facial radiance and texture.
- Wrinkle and radiance parameters were quantified and statistically compared using ANCOVA (age as covariate) including wrinkle surface area, deep & fine wrinkle surface area, deep wrinkle severity, deep wrinkle width, L* for radiance and texture.



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Example of Crow's Feet Analysis For Each Skin Fitzpatrick Skin Type III-CLARITY™ 3D System Images



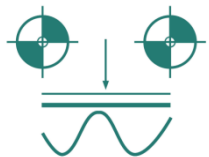
All wrinkles



Fine (light blue) & Deep wrinkles (Dark Blue)

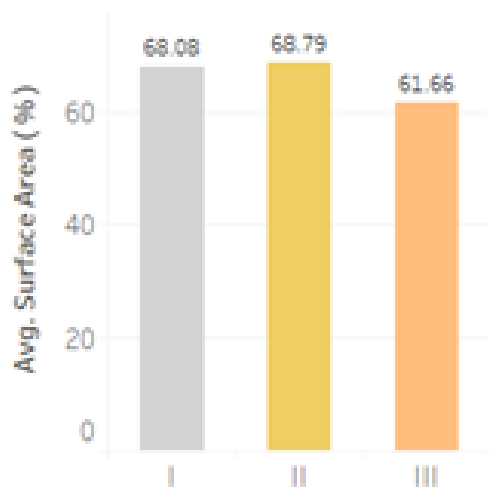


Deep wrinkles only

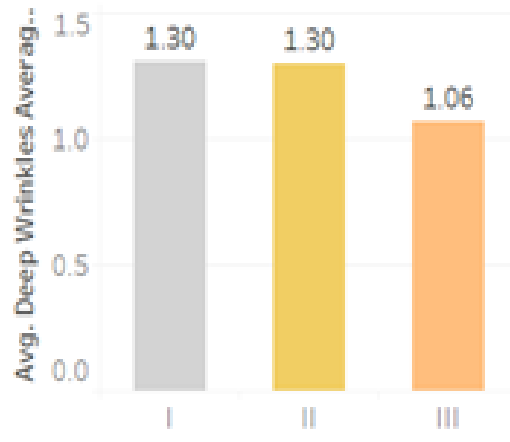


Lower Fitzpatrick Skin Types Significantly Correlate to Wrinkle Surface Area and Deep Wrinkle Width

Mean Surface Area % (Wrinkles)



Mean Deep Wrinkles Average Width (mm) (Wrinkles)



Fitzpatrick skin type	Sample size
I	23
II	37
III	17

Comparison among three Fitzpatrick skin types I-III using ANCOVA (age as covariate)			
Surface Area (%)			
I		0.908	0.030
II	0.908		0.014
III	0.030	0.014	
Deep Wrinkles Surface Area (%)			
I		0.909	0.236
II	0.909		0.132
III	0.236	0.132	
Deep Wrinkles Average Severity			
I		0.932	0.202
II	0.932		0.152
III	0.202	0.152	
Deep Wrinkles Average Width (mm)			
I		0.687	0.019
II	0.687		0.015
III	0.0185	0.0151	
Fine Wrinkles Surface Area (%)			
I		0.169	0.801
II	0.169		0.331
III	0.801	0.331	



Fitzpatrick Skin Type Significantly Correlates to Radiance and Texture

Comparison among three Fitzpatrick skin types using ANCOVA (age as covariate)

Lstar	I	II	III
I		0.478	0.150
II	0.478		0.020
III	0.150	0.020	

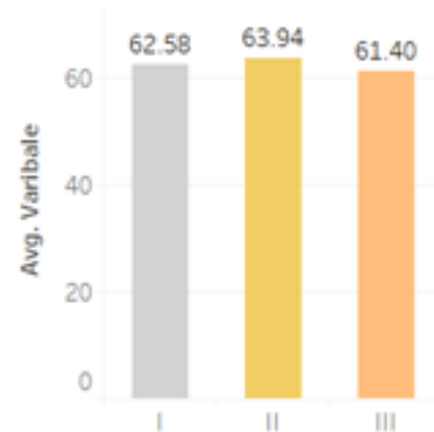
Fitzpatrick skin type	Sample size
I	23
II	37
III	17

Comparison among three Fitzpatrick skin types using ANCOVA (age as covariate)

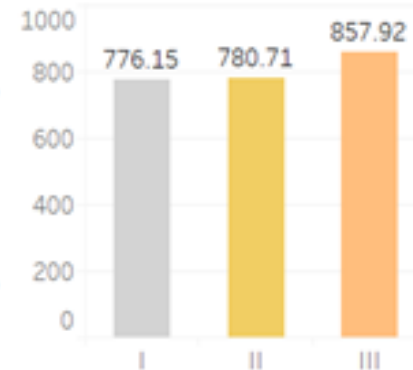
Texture	I	II	III
I		0.639	0.032
II	0.639		0.0297
III	0.032	0.030	

Clarity 3D Radiance analysis by Fitzpatrick Skin Type

Mean Lstar



Clarity 3D Texture analysis by Fitzpatrick Skin Type



Conclusions and Next Steps

Conclusions:

- Fitzpatrick skin types I-III from NJ significantly differ in their ability to tolerate UV light
- Representative Fitzpatrick skin types I-III differ in their Crow's feet aging in terms of deep wrinkles, surface area and texture.
- Inverse relationship seen with Fitzpatrick skin types I-III for radiance measures.
- Subject data skewed towards older females

Next steps:

- Continue to build image data base for more power, include data base from NC facility
- Collect more data on younger individuals and men
- Include additional global aging attributes like mottled pigmentation, moisture, elasticity and TEWL.
- Explore new methods to determine UV exposure risks in Fitzpatrick Skin Types IV-VI.



International Society for Biophysics and Imaging of the Skin

Skin: Surface to Depth

May 1-4, 2018

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Thanks to:

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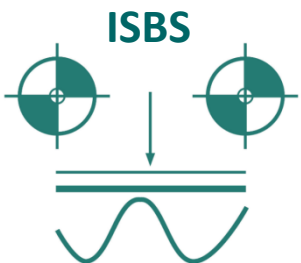
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