

# Skin Phototypes 2003

Susanne Astner and R. Rox Anderson

Wellman Laboratories of Photomedicine, Massachusetts General Hospital, Boston, Massachusetts, USA

"I believe it was Lord Adrian who said that Dermatology, unlike Beauty, is more than skin deep" (Fitzpatrick in Fitzpatrick *et al*, 1966)

Glory be to God for dappled things-  
For skies of couple-color as a brindled cow;  
For rose-moles all in stipple upon the trout that swim;  
Fresh-firecoal chestnut-falls; finches' wings;  
Landscape plotted and pieced-fold, fallow and plough;  
And all trades, their gear and tackle and trim,  
All things counter, original, spare and strange;  
Whatever is fickle, freckled (who knows how?)  
With swift, slow; sweet, sour; adazzle, dim;  
He fathers-forth whose beauty is past change;  
Praise him.

G.M. Hopkins (1844–1889)

Thomas B. Fitzpatrick (aka "Fitz", "TBF", "Doc") fathered modern dermatology, propelled it (and, himself) around the globe, educated generations of educators, revealed the machinery of human pigmentation, made sunscreens and PUVA, and cared so deeply for teaching patients, residents and colleagues that he gained a reputation for telling the truth, be it politically correct or not. Fitz loved people, and pigmentation.

Before the mid-1960s, the now controversial use of race-oriented skin color was typical. Caucasoid, Pigmented Caucasoid, American Indian or Amerindian, East Indian, Mongoloid, Oriental, Nordic, American or African Negroid, Celtic, Aboriginal and Egyptian – these were literally the scientific classifications for skin color. The abundance of different skin, eye, and hair colors reflect the heterogeneity within each racial category. Simple visual assessment of skin color was scientifically and clinically inadequate.

Dr Fitzpatrick and a mere handful of others elucidated the genetics, biochemistry, cell biology, and photobiology of skin's pigmentary system (Fitzpatrick and Breathnach, 1963). Careful studies of human skin (Szabo *et al*, 1969) revealed no significant differences in the actual number of melanocytes. Instead, racial differences in skin color come mainly from differences in the rate at which melanosomes are produced and melanized in melanocytes, and transferred, distributed, and degraded in keratinocytes (Fitzpatrick, 1965). Melanosomes, which Fitz had a hand in naming (Seiji *et al*, 1963; Toda and Fitzpatrick, 1971), were discovered to be smaller and aggregated in Caucasoids and Mongoloids, whereas they were larger and individually dispersed in American and African Negroids and Aborigines (Wolff and Konrad, 1971; Toda *et al*, 1972; Toda *et al*, 1973).

Clearly, skin color within each race also varies with sunlight stimulation, an effect that was found to depend on

the total exposure dose of solar radiation (Pathak *et al*, 1976). The ability to adjust melanization of epidermal cells after sunlight exposure reflected the individual melanogenic potential, which led to the concept of *facultative* and *constitutive* skin color (Pathak, 1985). Constitutive skin color designates a genetically determined level of cutaneous melanin, in the absence of acquired exogenous or endogenous influences. Facultative pigmentation, on the other hand, designates an induced level of increased epidermal melanin content as a result of solar radiation, hormones or other environmental factors. Race was fatally wounded as the primary classifier for human pigmentation, but what should replace it?

As Fitz occasionally told the residents, "When all else fails, listen to your patient." In the early seventies PUVA and UV-B phototherapy were in a developmental hey-day driven by T.B. Fitzpatrick, M.A. Pathak, and J.A. Parrish. Methods to predict the individual response to solar and artificial light exposures were needed. Objective measures such as skin reflectivity, and the number of melanosomes per keratinocyte, were compared with measurements of minimal erythema dose (MED), and with a visual skin color grading scale (Toda *et al*, 1973). Despite excellent correlations, a simpler method was needed to assess photosensitivity. The system of Fitzpatrick Skin Phototypes, originally introduced in 1975, is based essentially on listening to a patient's own report of skin responses after a significant sun exposure.

Two simple questions and a two-tier approach led to the current classification of Fitzpatrick Skin Phototypes: "Do you burn at the first average sun exposure?" and "Do you tan at the first average sun exposure?" At last, skin phototypes were not defined by race or ethnicity (see Table I), but by the wide range of different responses to sunlight (Pathak *et al*, 1976), and while the world of dermatology and photobiology largely accepted his standard phototypes, Fitz himself considered them a limited approach that he never stopped trying to improve. He used to tell one of us, "What kind of Mickey Mouse is this? First I ask how well you sunburn and tan, then I tell how well you sunburn and tan!" However, Fitzpatrick Skin Phototypes have proven value—low phototype is among the risk factors for both melanoma and nonmelanoma skin cancer; skin phototype is widely used for estimating UV, PUVA, and laser treatment doses.

Recently updated by Dr Fitzpatrick at the World Congress of Dermatology in Paris<sup>1</sup>, his skin phototypes are here to stay. Fitz's zeal for everything related to skin and

<sup>1</sup>Fitzpatrick, T.B. Skin Phototypes 2002, 20th World Congress of Dermatology, Paris, July 1–52002. (Poster # 1788).

Table I. Fitzpatrick's Skin Phototypes\*

Phototype	Sunburn & Tanning history (defines the phototype)	Immediate pigment darkening	Delayed tanning	Constitutive color (unexposed buttock skin)	UV-A MED (mJ/cm <sup>2</sup> )	UV-B MED (mJ/cm <sup>2</sup> )
I	Burns easily, never tans	None (-)	None (-)	Ivory White	20-35	15-30
II	Burns easily, tans minimally with difficulty	Weak ± (± to +)	Minimal to weak (± to +)	White	30-45	25-40
III	Burns moderately, tans moderately and uniformly	Definite +	Low +	White	40-55	30-50
IV	Burns minimally, tans moderately and easily	Moderate + +	Moderate + +	Beige-Olive, Lightly tanned	50-80	40-60
V	Rarely burns, tans profusely	Intense (brown) + + +	Strong, intense brown + + +	Moderate brown or tanned	70-100	60-90
VI	Never burns, tans profusely	Intense (dark brown) + + +	Strong, intense brown + + +	Dark brown or black	100	90-150

\*Adapted from Fitzpatrick's Dermatology in General Medicine. McGraw-Hill Professional; 5th edition.

sun exposure was infectious. There emerged another, much larger group of Fitzpatrick's skin phototypes. We are among them.

DOI: 10.1046/j.1523-1747.2003.22251.x

### References

- Fitzpatrick TB, Arndt KA, El Mofty AM, Pathak MA: Hydroquinone and Psoralens in the therapy of hypermelanosis and vitiligo. *Arch Derm* 93:589-600, 1966
- Fitzpatrick TB, Breathnach AS: Das Epidermal Melanin-Einheit System. *Dermatol Wochenschr* 147:481-489, 1963
- Fitzpatrick TB: Mammalian melanin biosynthesis. *Trans St John's Hosp Derm Soc* 51:1-25, 1965
- Pathak MA: Activation of the melanocyte system by ultraviolet radiation and cell transformation. *Ann New York Acad Science* 453:328-339, 1985
- Pathak MA, Kimbov J, Szabo G, Fitzpatrick TB: Sunlight and melanin pigmentation. In: Smith K (ed). *Photochemical and Photobiological Reviews*. Vol I, 1976; p 211-239
- Seiji M, Fitzpatrick TB, Simpson RT, Birbeck MSC: Chemical composition and terminology of specialized organelles (melanosomes and melanin granules) in mammalian melanocytes. *Nature* 197:1082-1084, 1963
- Szabo GS, Gerald AB, Pathak MA, Fitzpatrick TB: Racial differences in the fate of melanosomes in human epidermis. *Nature* 222:1081-1082, 1969
- Toda K, Fitzpatrick TB: The origin of melanosomes. In: Kawamura T, Fitzpatrick TB, Seiji M (eds). *Biology of Normal and Abnormal Melanocytes*. Tokyo: University of Tokyo Press, 1971; p 265-278
- Toda K, Pathak MA, Fitzpatrick TB, Quevedo WC Jr, Morikawa F, Nakayama Y: Skin Color: Its ultrastructure and its determining mechanism. In: Riley V, McGovern VJ, Russel P (eds). *Pigment Cell*. Vol 1, Mechanisms in Pigmentation. Basel: Karger, 1973, p 66-81
- Toda K, Pathak MA, Parrish JA, Fitzpatrick TB: Alteration of racial differences in melanosome distribution in human epidermis after exposure to ultraviolet light. *Nature New Biol* 236:143-145, 1972
- Wolff K, Konrad K: Melanin pigmentation: An *in vivo* model for studies of melanosome kinetics within keratinocytes. *Science* 174:1034-1035, 1971