

FORMALDEHYDE-INDUCED FLUORESCENCE OF EPIDERMAL MELANOCYTES OF CAUCASIAN AND NEGRO SKIN

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Abstract. Skin specimens from the lower lateral part of the chest were treated according to the histochemical method of Falck and Hillarp and the specific fluorescence of basal epidermal melanocytes of Caucasian and negro skin was studied. Fluorescent basal epidermal melanocytes were found in all 5 Caucasians studied. Only in one of 5 negroes did the number and fluorescence intensity of the melanocytes approach that seen in Caucasian skin. In 2 negroes, weak fluorescence was observed in a few melanocytes and in 2 others no fluorescent melanocytes were found.

It is generally thought that racial colour differences are due not to differences in melanocyte counts, but in the activity of melanocytes (9, 13, 14).

When biopsies from Caucasian skin are treated according to the histochemical method of Falck & Hillarp, melanocytes of the epidermis develop a green-yellow fluorescence (2, 3, 5). The intensity of the fluorescence is stronger in melanocytes that have been stimulated to increased melanin production (1, 10, 12) and an accumulation of dopa or dopa-containing compounds has been considered to explain the increased fluorescence. It seemed to be of obvious interest to investigate whether the high rate of melanin synthesis in negro skin was paralleled by strong fluorescence of melanocytes. In the present study Caucasians and negroes are compared for any difference in fluorescence of melanocytes in the basal layer of the skin.

MATERIAL AND METHODS

Punch biopsies of normal skin were taken from the lower lateral part of the chest of 5 negroes and of 5 Caucasians, aged 25 to 29 years. Immediately after removal, the pieces of tissue were immersed in propane cooled by liquid nitrogen. After freeze-drying and treatment with formaldehyde at 80°C, the specimens were embedded in

paraffin in vacuo and serially sectioned at 6 to 10 μ . Sections were mounted for fluorescence microscopy. For technical details see Falck & Owman (4).

As control for non-specific fluorescence a second biopsy specimen was treated in the same way except for the omission of formaldehyde.

A high-pressure mercury lamp was used for fluorescence microscopy. The light was filtered through 3-7 mm Schott BG 12 and passed through a dark-field oil immersion condenser. The secondary filter was a Schott OG 4, 1 mm.

RESULTS

All the *Caucasians* had fluorescent basal epidermal melanocytes. The number of melanocytes as well as the fluorescence intensity of the cells varied widely between individuals. Coarse fluorescent dendrites were seen in 2 subjects, and more delicate dendrites in 1 subject, while 2 had no visible dendrites.

Two *negroes* did not have any fluorescent basal melanocytes; 2 had a few. The fluorescent melanocytes in these subjects were located a little below the basal cells and seemed to be dropping into the dermis. The fluorescence of the melanocytes was weak. Only in 1 negro did the number and fluorescence intensity approach what was seen in the Caucasians. No fluorescent dendrites were observed in any of the negroes.

DISCUSSION

The absence of fluorescent melanocytes or the very small number of such cells in the basal layer of negro skin is remarkable. Absence of fluorescent melanocytes has been reported in weakly pigmented abdominal Caucasian skin that had not been exposed to the sun. The fluorescence of

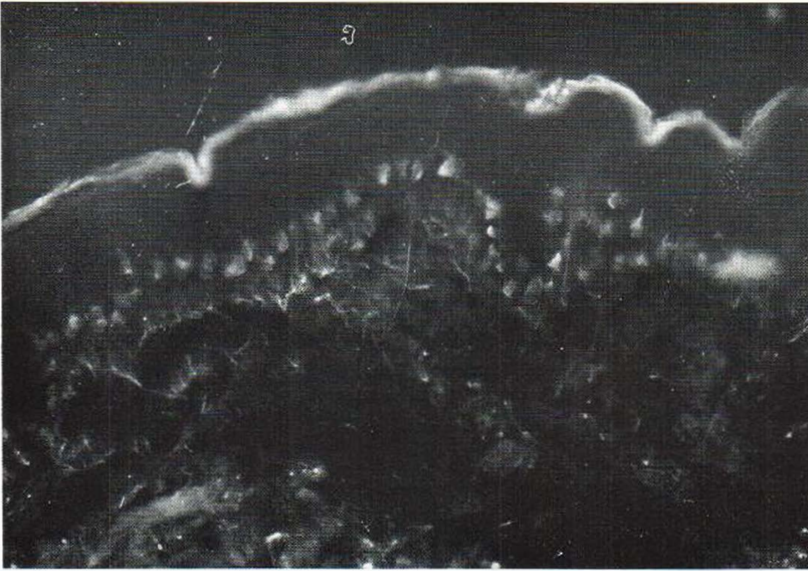


Fig. 1. Numerous, moderately fluorescent basal melanocytes in Caucasian skin. $\times 735$.

Caucasian melanocytes is stronger in cells with stimulated pigment formation (1, 10, 12) and it is surprising that the negro melanocytes, which synthesize melanin at a very high rate, were not strongly fluorescent. However, it seems possible that negro melanocytes accumulate smaller amounts of the intermediate catechol products that can condense with formaldehyde to form fluorescent substances. Dopa is one of the substances that can produce fluorescence with formaldehyde, but it has recently been demonstrated that dopa peptides and thioethers of dopa, formed by the

reaction of dopa-quinone and sulfhydryl compounds, also give fluorescence with formaldehyde (11).

Sulfhydryl compounds are effective inhibitors of tyrosinase (6, 7).

Reduced glutathione and glutathione reductase are significantly lower in negro skin than in Caucasian skin (8). A lower content of reduced glutathione in negro melanocytes might be part of the explanation for negro pigmentation. The intracellular level of reduced glutathione may also be of importance for the concentration of compounds

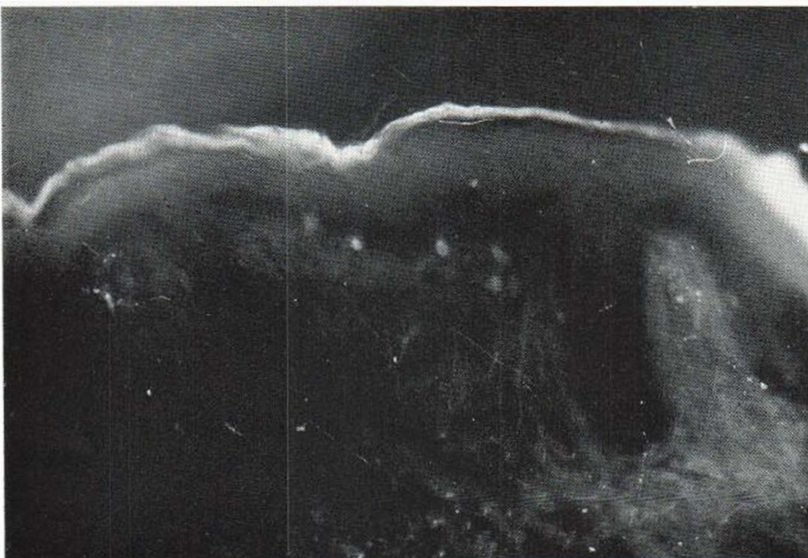


Fig. 2. A low number of moderately fluorescent melanocytes in negro skin. $\times 735$.

giving fluorophores after treatment with formaldehyde. Lower reduction of formed quinones and a more rapid polymerization of intermediates in melanin synthesis might explain the weak or absent fluorescence. But the low fluorescence of negro melanocytes may also simply be due to the high content of melanin, which quenches ultraviolet as well as visible light, thereby making the cells dark in spite of their content of fluorescent substances.

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