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Antioxidant Defense Mechanisms in Murine Epidermis and Dermis and Their Responses to Ultraviolet Light

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Abstract : A comprehensive comparison of antioxidant defenses in the dermis and epidermis and their response to exposure to ultraviolet (UV) irradiation has not previously been attempted. In this study, enzymic and non-enzymic antioxidants in epidermis and dermis of hairless mice were compared. Enzyme activities are presented both as units/gram of skin and units/milligram of protein; arguments are presented for the superiority of skin wet weight as a reference base. Catalase, glutathione peroxidase, and glutathione reductase (units/gram of skin) were higher in the epidermis than dermis by 49%, 86%, and 74%, respectively. Superoxide dismutase did not follow this pattern. Lipophilic antioxidants (-tocopherol, ubiquinol 9, and ubiquinone 9) and hydrophilic antioxidants (ascorbic acid, dehydroascorbic acid, and glutathione) were 24–95% higher in the epidermis than in dermis. In contrast, oxidized glutathione was 60% lower in the epidermis than in dermis. Mice were irradiated with solar light to examine the response of these cutaneous layers to UV irradiation. After irradiation with 25 J/cm2 (UVA + UVB, from a solar simulator), 10 times the minimum erythemal dose, epidermal and dermal catalase and superoxide dismutase activities were greatly decreased. Tocopherol, ubiquinol 9, ubiquinone 9, ascorbic acid, dehydroascorbic acid, and reduced glutathione decreased in both epidermis and dermis by 26-93%. Oxidizedgiutathione showed a slight, non-significant increase. Because the reduction in total ascorbate and catalase was much more severe in the epidermis than dermis, it can be concluded that UV light is more damaging to the antioxidant defenses in the epidermis than in the dermis.

Keywords : antioxidant defenses, enzymic, epidermis, oxidizedgiutathione
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