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## CONTROVERSIES IN DERMATOLOGY

### Sun Protection in Children: Realities and Challenges<sup>☆</sup>

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**Abstract** One of the main goals of all skin cancer prevention campaigns is to protect children from ultraviolet radiation. However, little is known about how sun exposure risks differ between adults and children or about how these risks are best managed. Children's skin is more susceptible to sun damage for a number of reasons, including certain anatomical and functional aspects in children under 2 years of age and habits that predispose to greater sun exposure during the first 2 decades of life. Oil-based emulsions containing inorganic filters appear to be safest sunscreens for children, although the addition of certain organic filters is necessary to achieve a sun protection factor of 50. Oxybenzone, and probably also octocrylene, should be avoided in sunscreens for children. Sunscreen use should be part of an overall sun protection strategy that includes avoidance of exposure to midday sun and the use of protective clothing and hats.

The above considerations justify the implementation of primary prevention campaigns focused on sun protection education for children and the continuation of basic and epidemiological research into specific sun protection strategies and sunscreens for each age group.

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#### Realidades y retos de la fotoprotección en la infancia

**Resumen** Proteger a los niños de la radiación ultravioleta es uno de los principales objetivos de todas las campañas de prevención del cáncer cutáneo. Sin embargo, el conocimiento acerca de las diferencias en riesgos derivados de la fotoexposición con respecto a los adultos y de las estrategias idóneas para afrontarlos son escasos. Entre los factores que favorecen una mayor susceptibilidad de la piel infantil se encuentran ciertos condicionantes anatómicos y funcionales en los niños por debajo de los 2 años de edad y hábitos de mayor exposición en las 2 primeras décadas de la vida. Los filtros en forma de emulsión en aceite con principios activos inorgánicos parecen ser los más seguros para los niños, aunque se requiere la adición de algunos filtros orgánicos para obtener un SPF 50. La oxibenzona y probablemente el octocrileno son filtros que deberían evitarse en los fotoprotectores pediátricos. El uso de fotoprotectores debe ser parte

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de una estrategia fotoprotectora basada en evitar la exposición solar en las horas del mediodía y usar ropas y gorros.

Todo ello justifica la implementación de campañas de prevención primaria que eduquen a los niños en hábitos de fotoprotección, y continuar la investigación básica y epidemiológica en la búsqueda de estrategias y fotoprotectores concretos para cada edad.

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## Introduction

The sun allows the existence of life on earth. It provides a feeling of well-being and controls our biological rhythms. It is also fundamental for the synthesis of vitamin D. However, solar radiation is also known to have harmful effects in both the short term (erythema, immunosuppression) and the long term (photocarcinogenesis, actinic damage). In order to minimize these adverse effects, a series of measures, known broadly as sun protection, have been developed. Sun protection measures are considered to be appropriate for the entire sun-exposed population. It has been suggested, however, that children may be especially susceptible to the harmful effects of solar radiation. These considerations, as well as social demand, have given rise to the development of sun protection product lines designed exclusively for children and the design of primary prevention strategies targeting children.

Although it may seem bold, it is fair to ask whether it really makes sense to consider children to be a differentiated target for sun protection measures. In other words, is there scientific evidence to justify distinguishing sun protection strategies for children from those intended for the rest of the population? A specific sun protection strategy for children would be reasonable if, for physiological reasons related to age or habits, childhood were intrinsically an additional risk factor for adverse effects of solar radiation. Children should also be considered separately if the components of sun protection strategies—for example, excipients contained in sunscreens or even the UV filters themselves—carry an additional risk in childhood because of the direct risks (allergic contact dermatitis, carcinogenesis) or indirect risks (e.g., hypovitaminosis D due to inadequate sun exposure) associated with these substances.

A second issue is also important: even if we establish that children are a differentiated group that requires a specific sun protection approach, we must determine whether the available strategies and technical possibilities are properly implemented.

## Is the Risk Associated With Sun Exposure Greater in Children Than in Adults?

### Risks Related to Sun Exposure Habits

The data on sun exposure in children are generally limited and mostly come from interviews with selected, voluntary groups. There is a tendency to consider that sun exposure time is greater in childhood than in adulthood. If this is true, much of the sun exposure—and, consequently, the risk—that

an individual accumulates over the course of his or her lifetime occurs during childhood. After reviewing data on 345 schoolchildren, Wright and Reeder<sup>1</sup> estimated that the mean daily sun exposure time was 2.3 hours and determined that exposure was greater on school days than on weekends. They therefore concluded that sun protection should be promoted in schools.

The erythema dose associated with this number of sun exposure hours is incredibly difficult to establish and, moreover, varies greatly as a function of latitude and climate conditions. It is generally considered that 25% to 50% of the total erythema dose that a person receives before the age of 60 years occurs during childhood (in accordance with the Convention on the Rights of the Child, adopted in 1990, a child is defined as a person under the age of 18 years).<sup>2,3</sup> It therefore appears that many individuals are most exposed to solar radiation during childhood and that the promotion of sun protection in children is justified.

### Key Point

Between 25% and 50% of the total erythema dose that a person receives before the age of 60 years is received during childhood.

## Risks Related to Structural Differences Between Children's Skin and Adult Skin

Another additional risk factor for children's skin could be related to the fact that children may be more susceptible than adults to damage caused by sunlight or that children's defense mechanisms may be less efficient than those of adults. The assumption that children's skin is more sensitive or susceptible to sun damage than that of adults appears to be justified in children under the age of 2 years.<sup>4</sup> Table 1 highlights the structural differences between infant skin and adult skin.<sup>5</sup> In children, the stratum corneum and the epidermis as a whole are thinner and corneocytes and granular cells are smaller and more numerous, suggesting more rapid cell turnover. In addition, the ratio of lipids to proteins is lower, as is the concentration of melanin. Diffuse reflectance spectroscopy studies have shown that the skin of children under the age of 12 months has a lower concentration of melanin than that of children between the ages of 16 and 24 months.<sup>6</sup>

In children older than 24 months, the thickness of the skin is similar to that of adults. However, because of the special anatomic structure of children's skin, the most superficial part of the dermal papillae is more exposed to solar radiation. The stem cells in the basal layer are therefore exposed

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