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Also in this issue:
Cetuximab ( <i>Erbitux</i> ) .....Page 46
Bevacizumab ( <i>Avastin</i> ).....Page 47
Correction.....Page 48

## PREVENTION AND TREATMENT OF SUNBURN

Solar ultraviolet (UV) light capable of injuring the skin is classified by wavelength into UVA I (340-400 nm), UVA II (320-340 nm) and UVB (290-320 nm). UVB is responsible for most of the erythema of sunburn. UVA has been implicated in the development of phototoxicity and photoaging. The FDA permits sunscreen manufacturers to claim broad-spectrum protection if their products block at least part of UVA II in addition to UVB.

**SUN AVOIDANCE** – Avoiding exposure to direct sunlight, especially from 10 AM to 3 PM when UV radiation from the sun is strongest, decreases but does not eliminate the risk of sunburn. Patients should also be advised to wear protective clothing, such as wide-brimmed hats, pants and long-sleeved shirts, and to apply sunscreen to exposed skin.

**SUNSCREENS** – Topical sunscreens usually contain combinations of organic chemicals that absorb various wavelengths of UV light. Most agents primarily absorb UVB radiation. Avobenzone (also called Parsol 1789) also absorbs both UVA I and UVA II. Menthyl anthranilate and oxybenzone also absorb some UVA II wavelengths. Inorganic physical sunblocks such as zinc oxide or titanium dioxide block penetration of human skin by both UVA I and II. After application, physical sunblocks are usually white or colored, but some newer formulations are transparent.

**Sun Protection Factor** – The sun protection factor (SPF) is calculated by dividing the dose of UV radiation needed to produce minimal erythema on skin protected by a sunscreen by the dose that produces the same degree of erythema on unprotected skin. SPF is determined indoors according to a standard protocol that uses artificial light sources and application of a defined amount of sunscreen (2 mg/cm<sup>2</sup>). Applied in this thickness, a sunscreen with an SPF of 2 blocks about 50% of UVB radiation, an SPF of 10 blocks 90%, an SPF of 15 blocks 93% and an SPF of 30 blocks 97%. The degree of protection against UVA is hard to quantify and is usually much less than protection against UVB (RS Stern, N Engl J Med 2004; 350:1526).

**Application** – Sunscreens should be applied 15-30 minutes before going out into the sun. Most people do not apply a thick enough layer to achieve the claimed SPF. Many apply only 0.5 to 1 mg/cm<sup>2</sup>, which would give a sunscreen with a labeled SPF of 15 a true SPF of 2 to 4 (SR Pinnell, J Am Acad Dermatol 2003; 48:1). To adequately cover all sun-exposed areas, the average adult wearing a bathing suit would need to use about 1 oz of sunscreen.

**Duration** – Wind, heat, humidity, and altitude can all decrease the effective SPF of a sunscreen. Concomitant use of insect repellents that contain DEET also decreases SPF. Even though

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newer sunscreens are more resistant to removal from the skin, to maintain protection the American Academy of Dermatology recommends reapplication every 2 hours and after swimming or heavy perspiration.

**TREATMENT** — Once the signs and symptoms of sunburn are present no treatment, including systemic corticosteroids, has unequivocally been shown to be effective. If started before exposure to sun or before visible erythema, topical corticosteroids and oral nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen (*Motrin*, and others) may slightly decrease erythema during the first 24 hours. There is no evidence that an oral corticosteroid is more effective. Emollients, antioxidants and antihistamines, taken systemically or applied topically, do not decrease the time to healing (MS Driscoll and RF Wagner, Jr, *Cutis* 2000; 66:53; A Han and HI Maibach, *Am J Clin Dermatol* 2004; 5:39). For symptom relief, emollients, cold compresses, topical anesthetics and oral acetaminophen or NSAIDs may be useful.

**CONCLUSION** — Prevention of sunburn requires sun avoidance, protective clothing and generous, frequent use of broad-spectrum sunscreens with SPF of  $\geq 15$ . No treatment has been shown to decrease the time to healing.