



# Commentary: Sunscreen Compliance with American Academy of Dermatology Recommendations: A 2022 Update and Cross-Sectional Study

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## Article Info

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Skin cancer remains the most common cancer affecting the United States population, estimating at least 9,500 cases diagnosed per day.<sup>1</sup> The National Cancer Institute predicts that approximately 99,780 new cases of melanoma will be diagnosed in 2022.<sup>2</sup> Exposure of ultraviolet radiation (UVR) to the skin is a major preventable risk factor. UVR, composed of UVA (320-400 nm) and UVB (280-320 nm) radiation, has damaging acute and chronic effects on the skin barrier, detrimentally associated with 90% of non-melanoma skin cancers (NMSCs) and 65% of malignant melanomas.<sup>3</sup> With increasing incidences for all types of skin cancer, decreasing exposure to UVR, in the form of sunscreen application and photoprotective clothing, is essential for protecting against potential skin cancer development.

According to the American Academy of Dermatology's (AAD) recommendations, optimal sunscreens that effectively limit UV light exposure should include three components: (1) broad-spectrum protection, (2) water resistance for 40 to 80 minutes, and (3) a sun protection factor (SPF) 30 or greater.<sup>4</sup> Despite the recommendations provided by the AAD, many sunscreen products fail to meet all three components. In addition, ambiguity of labels listed on sunscreen products may provide confusion and misleading information to the consumer. Thus, in 2021, the Food Drug Administration (FDA) has proposed updated regulations aimed at standardizing the use of terminology on sunscreen labeling to improve clarity and safety of sunscreen products. A recent study published by Hernandez et al aimed to assess whether sunscreen products available in major retailers and beauty retailers, Walmart, Walgreens, Ulta and Sephora, complied with AAD's recommendations for effective sunscreen protection.<sup>5</sup> Of the 755 products analyzed, 65.5% of sunscreens from Ulta, 42.9% of sunscreens from Sephora, 76.4% of sunscreens from Walmart, and 91.8% of sunscreens from Walgreens met all recommendations discussed by the AAD.<sup>5</sup> In addition, there was decreased compliance in observed among tanning and bronzing products sold across all stores.<sup>5</sup>

## Understanding SPF

SPF is a numerical reading of a standardized assessment of sunscreen efficacy, primarily screening for absorption of UVB radiation. Original guidelines were developed in 1993 by the FDA defining SPF as a numerical ratio of minimal erythema dose (MED) in sunscreen-protected skin versus non-protected skin. Standardized doses of sunscreen (2 mg/cm<sup>2</sup>) are applied to non-sun exposed areas of volunteers and

exposed to different intensities of UVR after fifteen minutes of sunscreen absorption.<sup>6</sup> The MED is calculated by the minimal dose of radiation causing erythema, or sunburn, in volunteers after 24 hours. Thus, AAD recommendations suggest an SPF of at least 30 to sufficiently protect from UVR, meaning that in sun-protected individuals, it will take 30 times longer to burn, when compared to non-protected individuals. AAD experts report that SPF 30 is essentially responsible for blocking 97% of UVB radiation if used properly.<sup>7</sup> Importantly, reproducibility of the SPF is most accurate after waiting for 15 minutes for sunscreen absorption. Additionally, a higher SPF number does not necessarily provide better protection against the sun, however, several studies have justified that applying a higher SPF (SPF >70) may compensate for inadequate sunscreen application by the consumer.<sup>8,9</sup> Among the products reviewed by Hernandez *et al*, 96.4% of Ulta products, 98.7% of Sephora sunscreens, 87.2% of Walmart sunscreens, and 95.4% of Walgreens sunscreens met this AAD recommendation.<sup>5</sup>

### Broad-Spectrum

Sunscreens that contain “broad-spectrum” on their labeling must meet FDA regulations for protection against both UVA and UVB radiation, as both have been implicated in carcinogenesis formation through varying mechanisms. Although UVB radiation constitutes 5% of terrestrial UVR hitting earth, it penetrates the epidermis of the skin with higher intensity than UVA. Thus, UVB radiation is responsible for the acute symptoms seen with UVR, including erythema, dyspigmentation and immune suppression. Because the damaging effects of UVB are noticeable within a 24-hour period, SPF testing mostly accounts for protection against UVB radiation. Absorption of UVB by DNA perpetuates a cell-mediated inflammatory response, resulting in structural damage of DNA and formation of cyclobutane thymine dimers (CTDs).<sup>3</sup>

Due to the stronger wavelength, UVA radiation penetrates 20 times deeper in the dermis of the skin than UVB radiation.<sup>6</sup> Through the formation of CTDs and oxidative free radicals, UVA has damaging chronic effects on photoaging, immunosuppression, and carcinogenesis. Although there are no current standardized ways to measure UVA absorption, multiple *in vivo* and *in vitro* models have been established. The modified Diffey *in vitro* model is typically used to assess whether sunscreens adequately protect against UVA radiation. Sunscreen is applied to a substrate, and absorbance is measured using a spectrophotometer. For sunscreens to have “broad-spectrum” on their labeling, at least 90% of absorption must be noted at the critical wavelength threshold at 370 nm, encompassing all of UVB and most of UVA emission.<sup>10</sup> Broad-spectrum labeling was observed in 100% of sunscreens found in Ulta, Sephora, and Walgreens, and 96.9% of sunscreens found in Walmart.<sup>5</sup>

### Water Resistance

Water resistant sunscreens exist in two formulations; water resistant (up to 40 minutes) and very water resistant (up to 80 minutes). Importantly, “water resistant” is distinguished from the “water proof”, as FDA regulations prohibited the use of this term due to misleading information (in what yr). The level of water resistance determines how long sunscreen lasts on the skin after water exposure, whether 40 minutes or 80 minutes. Thus, this dictates when reapplication of sunscreen is warranted. AAD recommends water resistance to be one of the components included when determining which sunscreen to purchase. Of the 755 sunscreens evaluated by Hernandez *et al*, 68% from Ulta, 42.9% from Sephora, 89% from Walmart, and 95.7% from Walgreens were labeled “water resistant”.<sup>5</sup>

Despite the beneficial effects that sunscreen has on photoprotection and skin cancer reduction, it does carry notable detrimental effects on the living aquatic coral reef environment. Sunscreens containing chemical compounds, notably oxybenzone, have been shown to be harmful at higher concentrations, resulting in decreasing biodiversity and functionality of the coral reefs.<sup>11</sup> One study suggested that even at low concentrations, negative effects of coral bleaching may be observed.<sup>12</sup> Thus, many sunscreen brands have supported the removal of oxybenzone initiative from their sunscreens to preserve the coral reefs found in our water life.

### Conclusion

Use of photoprotection to block UVR is essential for decreasing the risk of chronic damage to the skin and serving as prevention for developing NMSC and some melanomas. Consumers should rely on the AAD website and follow current recommendations for how to choose appropriate sunscreens. Many products sold at major retailers, like Walmart and Walgreens, meet all recommendations for effective sunscreen, while both beauty retailers, Ulta and Sephora, have significantly less products that have all three components. Most products available in the drug store and beauty market do provide sunscreen with water resistance. Understanding sunscreen labels may provide clarification on ambiguous terminology located on these labels and improve consumer education about choosing the appropriate sunscreen recommended by expert dermatologists.

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