More About: Sunscreen Use and Duration of Sun Exposure: a Double-Blind, Randomized Trial

The recent article by Autier et al. (1) invites some critical evaluation, since it has important public health implications. The authors assessed the influence of the sunscreen sun protection factor (SPF) on the duration of sun exposure and sunburn episodes in two groups of young people given unlabeled products of either SPF 30 or SPF 10. They concluded that sun exposure was 25% longer in volunteers who used SPF 30 than in those who used SPF 10. This finding is not surprising, but it is difficult to understand the basis of this increased exposure, since there was no difference in sunburn or skin-reddening episodes in the two study groups. Thus, an important question remains: What caused the SPF 30 group to sunbathe for longer periods? In other words, what clinical end point determined sun exposure behavior?

The authors state that both SPF groups used the same amount of sunscreen, which was estimated to be 25% to 33% of the amount required for SPF assessment. It is recognized that people use less sunscreen than under SPF test conditions (2). However, each volunteer was given a total of 300 mL (approx. 370 g) sunscreen, which is enough for a maximum of 10 whole-body applications per person if applied correctly. This amount is at best a 5-day supply, assuming two daily applications, whereas the mean holiday period was about 20 days, 8 of which, on average, had sunbathing activity. Such a limited supply of sunscreen might have encouraged rationing. In fact, the volunteers used much less than recommended—about 70 g—enough for two whole-body applications or 1 day’s supply. This observation suggests that the sunscreens were either hardly used at all or just applied to restricted areas.

Application of the product at a lower level than under SPF test conditions reduces the SPF (3). Assuming an approximately comparable degree of SPF reduction for both products (3) and allowing for 25% increased exposure time with the higher SPF product, the data predict that the SPF 30 group would have received less than 50% of the erythemal ultraviolet radiation (UVR) dose than the SPF 10 group on the sunscreen-treated sites. In other words, one would have expected the higher SPF group to be better protected from sunburn even though they spent 25% more time in the sun. Surprisingly, however, the cumulative sunburn and skin-reddening data suggest that this was not the case. Given the very low level of sunscreen use, it would have been useful to have assessed whether sunburn occurred on protected or unprotected sites.

The possible modifying effect of sunscreens on sun exposure is an important public health issue, and its study is most welcome. It would not be surprising if high SPF products were used by sun-sensitive people, especially the young, to allow longer sunbathing. However, the most likely determinant of long-term risk is the UVR exposure dose at the basal layer, rather than exposure time per se. Comparably applied, use of an SPF 30 product for twice as long as use of an SPF 10 product (with comparable UVR absorption profiles) will result in 1.7-fold better acute, and probably better, chronic, photoprotection of sunscreen-treated skin. In this context, the observations by Autier et al. (1) are interesting but are rather difficult to explain, since there seemed to be no differences in acute photoprotection. One possible explanation is that the goal of the study population was a tan and that sunburn was seen, incorrectly, as requiring for tanning. Overall, the data obtained by Autier et al. (1) suggest that the public still requires considerable education on the correct use of sunscreens.

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REFERENCES


Note

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Response

The correspondence by Young raises a number of points, some of which are easily addressed technical issues and others that are speculative.

The fact that the trial (1) achieved a well-balanced randomization for all practical purposes rules out the possibility that the difference in sun exposure duration could proceed from a difference in sun sensitivity between the two randomization groups.

Young’s assessment that participants did not receive enough sunscreen is incorrect. We intentionally provided participants with a quantity of sunscreen in considerable excess of the amount habitually used by most people. In fact, all of the participants came back with more than half of the sunscreen they received at the start of the study. From the daily record diaries, we calculated that participants used, on average, 0.5 mg/cm² of sunscreen, a figure often found in the literature (2).

Retardation of sunburn occurrence was the obvious clinical end point proposed by Young. Sunscreens have been primarily designed to prevent sunburns. It simply took a longer time for participants who used the sun protection factor (SPF) 30 sunscreen to get a sunburn. Although the participants who used SPF 30 remained longer in the sun, they experienced the same number of sunburn episodes as the participants who used SPF 10. This phenomenon poses a major public health concern, since, as Young correctly mentions, our trial also suggested that extension of sunbathing activities induced by sunscreen use was more pronounced in sun-sensitive participants [see Table 2 in (1)].

The SPF is an indicator derived from laboratory testing. Young’s reasoning on SPF is speculative, since it relies only on the experimental definition of SPF and does not take into account that participants who used SPF 30 also tended to sunbathe when the ultraviolet B radiation was greatest and that participants who used SPF 30 tended to adopt more
hazardous sun exposure behaviors, as evidenced by women sunbathing with naked breasts.

For various reasons, speculation on the virtues of sunscreen in real life based on laboratory experiments is common, even if we don’t know how a given laboratory result fits into the as yet unknown pathways between sun exposure and melanoma. In the past, such extrapolations were used to justify the addition of 5-methoxypsoralen (5-MOP), a tanning activator and known photocarcinogen in sunscreen preparations (3). Despite warnings from several scientists (4), these laboratory data were used to support the marketing of 5-MOP sunscreens in France, Belgium, and Greece, until they were banned by the European Commission in 1995, after an epidemiologic investigation (5) showed a direct greater melanoma risk among subjects who used 5-MOP sunscreens, especially if they were naturally sun sensitive.

Young concludes that people need to be educated on how to use sunscreens. But do we know what the correct use of these products is? When sun exposure is unintentional—i.e., not motivated by acquisition of a tan (e.g., gardening or skiing)—use of a sunscreen seems to decrease the incidence of sunburn, actinic keratosis, and squamous cell cancer of the skin, and the protection conferred correlates with the quantities used (6,7).

In intentional sun exposure, motivated by the acquisition of a tan, sunscreen use appears to increase melanoma incidence because it may encourage subjects to stay longer in the sun (2). In that respect, use of greater quantities of sunscreen during intentional sun exposure could well result in even longer sun exposures. The primary rule that guides medical practice is “First, do no harm” (Hippocrates, 460–375 B.C.). Hence, one should avoid promoting sunscreen use for intentional exposure to the sun (see www.iarc.fr for details).

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