Invited Commentary

Invited Commentary: Indoor Tanning—A Melanoma Accelerator?

Marianne Berwick* and Jean-François Doré

* Correspondence to Dr. Marianne Berwick, Departments of Internal Medicine and Dermatology, School of Medicine, University of New Mexico, MSC10 5550, Albuquerque, NM 87131 (e-mail: mberwick@salud.unm.edu).

Initially submitted August 17, 2016; accepted for publication September 30, 2016.

In this issue of the Journal, Ghiasvand et al. (Am J Epidemiol. 2017;185(3):147–156) present results from a longitudinal study of the association between indoor tanning and melanoma in a large cohort of Norwegian women. These new data further support previous findings on the damaging effects of tanning bed exposure on women, particularly young women. The authors present compelling evidence that early exposure to tanning beds advances the date of diagnosis of melanoma by at least 2 years. With a strong design and a large cohort followed for a mean of 13.7 years, this study lends additional support to previous evidence of the negative effects of tanning beds and provides further justification for stronger policy initiatives designed to reduce tanning bed use among young women.

indoor tanning; melanoma; prospective studies

Abbreviations: CI, confidence interval; IARC, International Agency for Research on Cancer; UV, ultraviolet; UVA, ultraviolet A; UVB, ultraviolet B.

The Ghiasvand et al. (1) study published in this issue of the Journal brings new and important information to the long list of studies that have demonstrated the carcinogenicity of sunbed exposure. What is new about this study is its rigor—that is, a cohort study in which 141,045 women were followed for a mean of 13.7 years and 861 had a subsequent diagnosis of melanoma—and the young age at diagnosis—where those who started tanning under the age of 30 years were, on average, 2.2 years younger at diagnosis than those who had never tanned (1). While the latter finding was not statistically significant, it mirrors other findings such as those of Lazovich et al. (2), who found that women who started tanning under the age of 30 years were (significantly) 6 times more likely to develop melanoma than those who had never tanned. Thus, this rigorous, long-term study with an extremely large population has set the stage for policy designed to more carefully regulate indoor tanning, particularly among young women.

In 2009, the International Agency for Research on Cancer (IARC) classified the ultraviolet (UV) radiation emitted by sunbeds as a group 1 carcinogen (i.e., carcinogenic to humans) (3). This classification was based on a comprehensive review of the case-control literature available at that time and a meta-analysis of 19 studies that had evaluated the association between sunbed exposure and melanoma and other skin cancers (3). The results of the meta-analysis showed that exposure at a young age is the most damaging. The IARC found a significant summary relative risk for “first exposure under the age of 35” of 1.75 (95% confidence interval (CI): 1.35, 2.26), a relative risk for “ever use” of sunbeds of 1.15 (95% CI: 1.00, 1.31), and a relative risk for “exposure distant in time” of 1.49 (95% CI: 0.93, 2.38); for “recent exposure,” a relative risk of 1.10 (95% CI: 0.76, 1.60) was found (3). This finding for recent exposure supports the hypothesis of a promoter effect of UV radiation.

Since this classification, several major case-control (2, 4–6) and cohort (7) studies and an ecological analysis of a melanoma epidemic in Iceland (8) have brought forth further evidence of the carcinogenic risk associated with sunbed exposure. A more recent (2012) meta-analysis based on 27 studies showed a summary relative risk of 1.20 (95% CI: 1.08, 1.34) for ever use of sunbeds (9). When the analysis was restricted to cohort studies and population-based studies, the summary relative risk was 1.25 (95% CI: 1.08, 1.34) for ever use of sunbeds (9). When the analysis was restricted to cohort studies and population-based studies, the summary relative risk was 1.25 (95% CI: 1.08, 1.34) for ever use of sunbeds (9). When the analysis was restricted to cohort studies and population-based studies, the summary relative risk was 1.25 (95% CI: 1.08, 1.34) for ever use of sunbeds (9).
sunbed use per year. Furthermore, based on 13 informative studies, first use of sunbeds before age 35 years was associated with a summary relative risk of 1.87 (95% CI: 1.41, 2.48).

The Ghiasvand et al. study (1) further supports a dose-response association and a more pronounced effect when initiation of sunbed exposure takes place at an earlier age. However, the most original finding is an earlier onset of melanoma among sunbed users, again more pronounced in women who started using sunbeds before the age of 30 years.

UV radiation is a complete carcinogen: It is both an initiator of carcinogenesis and a promoter. UV exposure early in childhood positively influences (initiates) melanoma risk in adulthood (10, 11), while UV exposure in adulthood is likely to enhance melanoma development in the following months or years and may thus be associated with seasonal variation in melanoma incidence (12) or with increased melanoma risk, especially among young sunbed users (5, 8). It has been suggested that sunbed use is associated with increased risk of early-onset melanoma—the risk increasing with greater use, with earlier age at first use, and for earlier-onset disease, and with the association being stronger for melanoma diagnosed at ages 18–29 years (for >10 lifetime sessions, odds ratio = 6.57, 95% CI: 1.41, 30.49) than for melanoma diagnosed at ages 30–39 years (odds ratio = 1.60, 95% CI: 0.92, 2.77; P-interaction = 0.01) (5). Among persons who had ever used a sunbed and were diagnosed at 18–29 years of age, three-quarters (76%) of melanomas were attributable to sunbed use (5). At a general population level, the risk of melanoma attributable to sunbed exposure is far from negligible: In the 2012 meta-analysis, Boniol et al. (9) estimated that in the 15 countries that were members of the European Community and the 3 countries that were part of the European Free Trade Association, an estimated 3,438 (5.4%) melanomas diagnosed each year were related to sunbed use.

Some have suggested that the use of tanning beds may be beneficial in supplying vitamin D3 (which is formed in the skin after UV exposure), particularly among persons living in northern climates, such as Norway. However, the International Commission on Illumination has thoroughly evaluated the spectral output of tanning beds and has concluded that tanning beds in both countries not subject to European Union regulation and countries supposedly subject to it have UV radiation outputs that exceed safe limits (13). In fact, in Norway, Nilsen et al. (14) found that ultraviolet A (UVA) or long-wave radiation is on average 3.5 times as strong as the Oslo sun in the summer, while the strength of ultraviolet B (UVB) or short-wave radiation ranges from 0.5 times to 1.5 times that of the Oslo sun in the summer. Because UVA exposure differs from UVB exposure in that UVA exposure provides little protection against further UV radiation, and because UVA radiation is now recognized as a potent carcinogen, these measurements are alarming.

There are in fact beneficial aspects of UV exposure from sunlight, such as adaptation of skin to protect itself from the damaging effects of UV radiation, lowering of blood pressure, and potentially positive associations with the risks of multiple sclerosis and diabetes. However, the excessive radiation and uncertain nature of exposures from tanning beds precludes a clear understanding of their role in the positive effects otherwise noted for exposure to solar radiation.

This study by Ghiasvand et al. (1) is very important with regard to public health policy. Following the IARC classification of sunbeds as a group 1 carcinogen (3) and bans on tanning devices in Brazil and Australia, several countries are currently considering and/or reinforcing sunbed legislation. In Europe, a standard limiting the maximum erythemally weighted irradiance of sunbeds to 0.3 W/m2 or 11 standard erythema doses per hour (equivalent to a tropical midday sun) has been adopted (15). However, the Health and Food Safety Directorate of the European Commission recently convened a working group on the health effects of sunbeds, and in its Preliminary Opinion the group stated that there is no safe level of exposure (15). Additionally, the International Commission on Illumination recently evaluated the utility of tanning beds for maintaining optimal vitamin D levels during the winter and found that they cannot be recommended, because of the risk and uncertainty surrounding the UV output of tanning beds, which were not designed for stabilizing or increasing vitamin D levels, and because the appropriate exposure, such as duration and frequency of use, cannot be assessed (13).

There is now ample evidence of the harms of sunbed use, particularly for young people. Even if some data tend to show that UV exposure may be associated with a better prognosis of melanoma (12, 16), it is not clear what mechanisms of UV exposure might be associated with improved prognosis. The motivation for artificial tanning is essentially a cosmetic one, and alternative solutions are available, such as self-tanning lotions and sprays, which thus far have not been shown to be carcinogenic. Public health authorities should strongly discourage use of indoor tanning beds, particularly by younger individuals.

ACKNOWLEDGMENTS

Author affiliations: Departments of Internal Medicine and Dermatology, School of Medicine, University of New Mexico, Albuquerque, New Mexico (Marianne Berwick); Centre de Recherche en Cancérologie de Lyon, Centre Léon Bérard, Centre National de la Recherche Scientifique 5286, Institut National de la Santé et de la Recherche Médicale 1052, Université Claude Bernard Lyon 1, University of Lyon, Lyon, France (Jean-François Doré); and International Prevention Research Institute, Ecully, France (Jean-François Doré).

M.B. was supported by grant 1R01 CA181241-03 from the National Cancer Institute.

Conflict of interest: none declared.

REFERENCES