Scientific Opinion on:

The amendments to the radiation protection act and the radiation protection regulations

The recent proposal by the Norwegian Radiation and Nuclear Safety Authority (DSA) calls for a stricter regulation of sunbeds. The requested changes to the regulations include prohibition of advertising of solariums and the cessation of solariums establishments in the event of a breach of the age control requirements. I am of the opinion that this proposal should not be implemented as it is based on the faulty premise, that sunbed induced ultraviolet radiation (UVR) has an overall negative impact on general health.

The proposed changes are grounded in two key assertions s: 1) There are no documented health benefits from solarium use, and 2) UVR is carcinogenic. Based on these statements, the DSA expects an overall negative health impact from sunbed use and consequently, overall health benefits from a decrease in sunbed use. However, these statements are wrong and misleading.

(1) There is no documented health benefit from solarium use.

Sunbeds are emitting UVR which has been shown to have a flurry of health benefits (see our recently published review[1]). As early as 1941, evidence suggested that U.S. states with higher solar radiation levels had lower skin cancer mortality rates.[2] More recently a multitude of studies have gathered positive effects of UVR. One example is when Lindqvist and colleagues investigated a cohort of 29,518 Swedish women who were tracked in the 1990s.[3,4] They were tracked to investigate skin cancer prevalence in accordance with their stated sun seeking behaviour. A reanalysis of the cohort found that individuals who most consistently avoided sun exposure had nearly twice the mortality rate of those with the highest levels of sun seeking behaviour.[3] A recent investigation into the United Kingdom biobank data shows the positive effects of solariums even more directly.[5] They found that more UVR radiation led to less all-cause mortality. Importantly, they showed this was true when looking at annual average residential shortwave radiation (via satellite data) but found the same effect for solarium users (compared to non-solarium users). They also did not find an association between solarium use (or higher annual residential radiation) and melanoma incidence or melanoma mortality. However, in every other mortality category (cardiovascular disease (CVD); cancer; non-cancer/non-CVD) solarium users had significantly lower mortality risk than their non-solarium user counterparts. This analysis was thoroughly corrected for a multitude of different confounder (multiple variables per category: demographics, area deprivation, socioeconomic status, health behaviours and clinical factors). This study especially relevant to the proposal, as the analyses were based on individuals with white European descend and performed in a country (UK) with a similar latitude as Norway.[5]

What's more, different studies found a flurry of other beneficial health effects associated with UVR exposure.[1] Some of these include a decreased risk of COVID-19 death,[6] lowered incidence rates and less severe cases of multiple sclerosis,[1,7–9] regulatory effects on the skin and gut microbiomes,[10,11] less diagnoses of inflammatory bowel disease,[12] effects on metabolic, reproductive and sexual behaviours,[13–16] effects on arterial hypertension,[17–21] association with reduced development of obesity and metabolic syndrome,[22,23] improved control of already established obesity,[24] inverse relation to type 2 diabetes mellitus,[25] and a reduction in esophageal and gastric cancer incidences.[26,27] Generally, UVR seems to have an overall positive effect on for stabilization of the immune system.[28,29] The literature also suggests beneficial UVR effects in children. Higher UVR exposure as a child is associated with lower risk of childhood type 1 diabetes mellitus in boys.[30] UVR exposure during pregnancy is also inversely associated with learning disabilities.[31] This finding was explicitly linked with ultraviolet B (UVB), the more carcinogenic part of UVR (compared to ultraviolet A (UVA)).[32–34] Another study suggests that children who had more UVR exposure during the first 3 months of life develop less medically diagnosed eczema.[35] Importantly, these benefits cannot be directly attributed to vitamin D alone and cannot be achieved through vitamin D supplementation.[1] Multiple pathways through which UVR may regulate different systems beyond vitamin D are described in the literature (see reviews[1,36–39]).

(2) UVR is carcinogenic.

While UVR is carcinogenic, the only robust connection shown between UVR and cancer is for basal cell carcinoma (BCC), a type of cancer with very small mortality risk.[40] While

BCC has a robust correlation with cumulative UVR exposure, research shows that individuals with diagnosed BCC actually have a higher life expectancy than people with no diagnosed BCC.[41] Once more hinting at the beneficial health effects discussed in the previous section. The deadlier, more clinically relevant type of skin cancer is melanoma.[42] However, its connection do UVR is less well understood.[43] As mentioned in the proposal, some studies found moderate associations with melanoma risk for first exposure to UV radiation from a solarium at younger age and for high exposure rates.[44] But the same study states: “However, for all outcomes analyzed, overall study quality and resulting levels of evidence (3a-) and grades of recommendation (D) were low due to lack of interventional studies and severe limitations including unobserved or unrecorded confounding”.[44] The group ended up concluding, that “Current scientific knowledge does not demonstrate a causal relationship between moderate solarium use and melanoma risk. Therefore, the debate is not closed”.[43] The proposal presents these ambiguous results on the association of solarium use and melanoma incidence as hard facts. Looking at the general UVR research, the association does not become clearer. Once again it seems that, if there is any connection between reasonable UVR exposure and melanoma risk, the connection is very small (and often not statistically significant).[5] For example in US counties melanoma incidence actually barely correlates with the UVR exposure (r=.09), while it correlates close to perfectly with the number of dermatologists per county (r=.96).[45] A clear indication of a detection bias. Importantly, in light of the beneficial health effects, it seems that even if melanoma incidence was slightly elevated by UVR exposure, overall melanoma mortality is lowered.[2,5]

In conclusion, I show that the premises for the proposal are wrong. While it is the prevalent view in the public eye, UVR exposure (via sunbeds or other means) does not equal skin cancer or unhealthy behaviour.[46] A more reasonable understanding of the subject is needed to improve the general populations health.[46] Current research clearly suggests, on average, we require more UVR than we currently expose ourselves to.[1,5] Thus, a forced reduction in solarium use is more likely to harm general health rather than improve it. The fact that the proposal repeatedly compares the suggested regulations to the regulations on tobacco is also rather ironic, as the 2016 paper by Lindqvist and colleagues found that: “Nonsmokers who avoided sun exposure had a life expectancy similar to smokers in the highest sun exposure group, indicating that avoidance of sun exposure is a risk factor for death of a similar magnitude as smoking.”.[4]

Sincerely,

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