

Updated scientific overview

There is a lot of confusion caused by different public health messages that are often one-sided and focus mainly on the adverse effects while completely neglecting any health benefits of moderate and responsible exposure to UV radiation. Actually, many scientists agree, that if practiced in moderation and especially avoiding sunburn, the health benefits far outweigh the adverse effects! Furthermore, in a professional studio, sunbeds provide the advantage of being in a controlled environment in comparison to sunlight exposure.

An often overlooked fact is also, that the sun and sunbeds provide other health benefits besides the mainly mentioned vitamin D synthesis. Exposure to UV radiation is also releasing nitric oxide in the skin which has a vasodilative effect on the blood vessels and therefore decreases hypertension and the risk for other cardiovascular diseases. Other mediators include serotonin, beta-endorphin, among others, which contribute to the well-being in many ways.

Most reports and papers still use outdated scientific findings, which often rely on data where the use of tanning equipment outside of professional tanning facilities, including equipment used at home and for medical purposes have not been excluded. Also, they include data from other continents (e.g. Australia) where the European irradiation limit of 0.3 W/m^2 has not been applied. Further, most of the studies referred to have included skin type I persons that are not allowed to use professional sunbeds in Europe.

Below, you can find a list* of the most important studies in various fields, which underline the benefits of moderate sunbed use or exposure to sunlight:

Vitamin D

Vitamin D, which is actually a hormone, is of central importance to human health. It affects the personal risk of several cancers, plays a role in hypertension and cardiovascular diseases as well as other illnesses, such as diabetes, depression, multiple sclerosis among others. The main and natural way to produce vitamin D is through UVB exposure. It's estimated that 80 to 90% of a person's daily requirement comes from UVB exposure.

Sunlight or artificial sources of UVB radiation like sunbeds provide this essential nutrient as they trigger the synthesis in the skin. Other sources, such as few foods and vitamin D supplements, can only slightly contribute and don't provide other health benefits besides vitamin D that you receive from sun and sunbeds.

Hosseini-Nezhad & Hollick (2013), Vitamin D for Health: A Global Perspective

Vitamin D deficiency

It is now generally accepted that vitamin D deficiency is a worldwide health problem that affects not only musculoskeletal health but also a wide range of acute and chronic diseases.

Probably the most controversial topic among scientist is the amount of vitamin D needed for good health, with recommendations varying from 25 ng/ml to up to 50 ng/ml.

As there is no consensus, the numbers of vitamin D deficiency or even insufficiency greatly vary. There are studies, that claim 69.5% of the population in the United States and 86.4% in

Europe are vitamin D deficient and estimate that 9.4% of all deaths in Europe and 12.8% in the United States could be attributable to vitamin D insufficiency.

Garland et al. (2014), Meta-analysis of all-cause mortality according to serum 25-hydroxyvitamin D
Lips et al. (2019), Current vitamin D status in European and Middle East countries and strategies to prevent vitamin D deficiency; a position statement of the European calcified tissue society

Sunbeds and vitamin D

In an experiment, using a EN 60335-2-27 compliant sunbed, researchers from the Leiden University investigated on the hypothesis that higher vitamin D blood levels are linked to a lower risk of getting a cold.

As a result, the vitamin D blood level in sunbed users rose from 24,8 to 43,6 ng/ml and supplement users from 23,2 to 37,2 ng/ml over an 8-week period.

The researchers stated:

“Overall, our study showed sub-sunburn sunbed treatment to be effective in tanning and in increasing the 25(OH)D serum level, more so than oral vitamin D supplementation by 1000 IU per day.”

De Gruijil et al (2012), The effects of a mid-winter 8-week course of sub-sunburn sunbed exposures on tanning, vitamin D status and colds

Vitamin D supplements vs. sun exposure

There are other health effects of exposure to UVB than just the synthesis of vitamin D in the skin. Researchers proved in an animal model that UVB rays were responsible for a reduction in the autoimmunity rather than the vitamin D.

Wang et al. (2013), Suppression of experimental autoimmune encephalomyelitis by 300-315nm ultraviolet light

“In light of vitamin D-independent health outcomes related to sun exposure, it is apparent that vitamin D supplements are not an effective substitute for adequate sun exposure.”

David G. Hoel, Department of Public Health Sciences, Medical University of South Carolina, USA

Sun Avoidance

Surprisingly, the researchers observed no differences in all cause mortality or cutaneous malignant melanoma (MM) mortality between those who exposed themselves to the sun and those who avoided the sun. Additionally, those who avoided the sun experienced a shorter life expectancy (0.6 – 2.1 years shorter life expectancy) as they were at a higher risk of death from heart disease and stroke, diabetes, multiple sclerosis and pulmonary disease. When comparing smokers who sunbathed to non-

smokers who avoided the sun, the researchers found that the women had an equal risk of mortality.

Lindqvist et al. (2016), Avoidance of sun exposure as a risk factor for major causes of death: a competing risk analysis of the Melanoma in Southern Sweden cohort.

Release of endorphins, serotonin

There is no research or statistics needed to make the connection between sunshine and good mood or even happiness. It was shown that the release of serotonin and endorphins in the blood is dependent from the season or, more specifically, from the amount of time spent in the sun. Even though it is not fully established, there might be a link between seasonal affective disorder and other depressive disorders and the absence of sunlight.

Lambert et al. (2002), Effect of sunlight and season on serotonin turnover in the brain
Sansone et al. (2013), Sunshine, Serotonin, and Skin: A Partial Explanation for Seasonal Patterns in Psychopathology?

Cancer

There is strong evidence, that sufficient vitamin D levels, reduce the risk of more than 20 different types of cancer as well as their mortality as they improve the chances of surviving this devastating disease.

Women with vitamin D serum levels greater than or equal to 40 ng/ml had a 71% lower risk of cancer than women with serum levels less than 20 ng/ml.

Maintaining vitamin D in the range of 40–60 ng/ml reduces the risk of many cancers. Studies have identified more than 19 cancers that have mortality rates inversely correlated with solar UVB doses.

A study with data from over 5000 women, aged 55 and older, from two randomized trials show a 78-82% lower risk of breast cancer for women with vitamin D levels of 60 ng/ml or greater, as compared to women with vitamin D levels less than 20 ng/ml.

A research team found a 19% lower risk of colorectal cancer for participants who reported sun exposure of 2 or more hours per day compared to 1-2 hours per day in the prior summer. Also, those with a higher lifestyle sun exposure score, based on sun exposure in the previous summer and 10 years prior had a lower risk of colorectal cancer.

McDonnell (2016), Serum 25-Hydroxyvitamin D Concentrations ≥ 40 ng/ml are Associated with $>65\%$ Lower Cancer Risk: Pooled Analysis of Randomized Trial and Prospective Cohort Study

Grant (2019), Vitamin D3 from Ultraviolet-B exposure or Oral Intake in Relation to Cancer Incidence and Mortality

Moukayed & Grant (2013), Molecular link between vitamin D and cancer prevention

Vallès et al. (2018), Colorectal cancer, sun exposure and dietary vitamin D and calcium intake in the MCC-Spain study

Skin Cancer / Melanoma

There is no doubt, that overexposure to UV radiation is increasing the risk for all types of skin cancer, mainly by getting a sunburn. But, there are other studies, that prove that non-burning sun-exposure is actually protective against melanoma.

Further, a 20-year Swedish study showed that women who used sunbeds had a 23% decrease in all-cause mortality compared to women who did not use them. Moreover, the authors have not found an increased risk for melanoma after the 20-year period.

In May 2019, results from a study investigating the association between vitamin D levels and the risk of melanoma were published. The findings suggest that both deficient and insufficient serum levels of vitamin D are associated with melanoma and that a trend seems to be present with a reduced risk of melanoma when vitamin D approaches normal values.

Another study demonstrated that the greater the numbers of hours spent in the sun during weekends, the lesser the risk for melanoma. People who spent 4-5 hours in the weekend sun had a 28% decrease in melanoma risk!

Further, a number of studies present reliable data, indicating the many other factors that contribute to the risk of skin cancer. Next to smoking, drinking alcohol also having a family history of melanoma leads to an increased risk (74% risk of melanoma, 22% squamous cell carcinoma and 27% basal cell carcinoma).

Lindqvist et al. (2014), Avoidance of sun exposure is a risk factor for all-cause mortality: results from the Melanoma in Southern Sweden cohort.

Cattaruzza et al. (2019), 25-Hydroxyvitamin D serum levels and melanoma risk: a case-control study and evidencesynthesis of clinical epidemiological studies

Newton-Bishop et. al (2011), Relationship between sun exposure and melanoma risk for tumors in different body sites in a large case-control study in a temperate climate.

Wei et. al (2019), Having a first-degree relative with melanoma increases lifetime risk of melanoma, squamous cell carcinoma, and basal cell carcinoma

Cardiovascular diseases

The above mentioned vitamin D deficiency is also associated with a higher risk of cardiovascular diseases and hypertension including a higher cardiovascular mortality. Next to the effects of vitamin D, it was shown that UV-A radiation increases circulating nitric oxide in the skin, which has a vasodilative effect on the blood vessels and causes a decrease in hypertension and other cardiovascular diseases.

Kheiri et al. (2018), Vitamin D deficiency and risk of cardiovascular diseases: a narrative review

Weller (2016), Sunlight has cardiovascular benefits independently of vitamin D

Multiple Sclerosis

There are multiple studies that show a link between exposure to sunlight and multiple sclerosis as well.

In one prominent study, the researchers found that those living in high UVB areas before the onset of MS had a 45% lower risk of MS compared to those living in low UVB areas ($P < 0.0001$). Also, those who spent 10 or more hours per week outdoors in the summer in high UVB areas during ages 31-40 had an 82% lower risk of MS compared to those who spent less than 10 hours per week outdoors in low UVB areas ($P = 0.01$).

Another team found a 43% increased risk of multiple sclerosis in women, when comparing serum vitamin D concentrations, which can be seen as a marker for sunlight, of below 12 ng/ml vs. above 20 ng/ml.

Tremlett et al. (2018), Sun exposure over the life course and associations with multiple sclerosis

Munger et al. (2017), 25-Hydroxyvitamin D deficiency and risk of MS among women in the Finnish Maternity Cohort.

Diabetes

Many studies have shown that high serum levels of vitamin D are inversely related with the risk of both, diabetes type I and type II. Researchers found that patients with vitamin D levels > 30 ng/ml had only one-third the incidence of diabetes as those with ≤ 30 ng/ml.

Additionally, findings from a 2010 cohort study indicated that women with active sun exposure habits were at a 30% lower risk of having diabetes mellitus, as compared to those with non-active habits. One study even suggests, that the benefits regarding the development of diabetes might be independent of the vitamin D concentrations and that instead other effects of UV exposure are responsible for reduced risk of type 2 diabetes.

Lindqvist et al. (2010), Are active sun exposure habits related to lowering risk of type 2 diabetes mellitus in women, a prospective cohort study?

Park et al (2018), Plasma 25-hydroxyvitamin D concentration and risk of type 2 diabetes and pre-diabetes: 12-year cohort study

Geldenhuys et al. (2014), Ultraviolet radiation suppresses obesity and symptoms of metabolic syndrome independently of vitamin D in mice fed a high-fat diet.

Alzheimer

Several published studies have linked low vitamin D levels to an increased risk of Alzheimer's disease and other dementias. Vitamin D deficiency was associated with a faster cognitive decline as well as a 3-fold increase in the risk of Alzheimer's disease.

Feart et al. (2017), Associations of lower vitamin D concentrations with cognitive decline and long-term risk of dementia and Alzheimer's disease in older adults

Negative effect of sunscreens

Sunscreens are not as safe as a product as the manufacturers want to make us believe. Further, the recommendations of dermatologists to use sunscreen every single day is exaggerated and even harmful as sunscreen with an SPF of 15 reduces vitamin D synthesis by 95%.

In a study, researchers found that plasma concentrations of four typical ingredients of chemical sunscreen available as over-the-counter product (avobenzone, oxybenzone, octocrylene and ecamsule) exceeded the threshold established by the FDA. The clinical impact of that needs to be the focal point of future research.

Matta et al. (2019), Effect of sunscreen application under maximal use conditions on plasma concentration of sunscreen active ingredients

Overview articles – positive effects of exposure to sunlight

The growing evidence and overwhelming amount of health benefits of exposure to sunlight and UV radiation in general on human health is best summarized in the two overview articles by David Hoel and Frank de Gruijl. In their 2018 article they also challenge the policymakers and call for changes in the public health directives.

Hoel et al., (2016), The risks and benefits of sun exposure 2016

Hoel & de Gruijl (2018), Sun exposure public health directives

Critical appraisal of the IARC/WHO/SCHEER reports

As mentioned in the beginning of this document, the IARC/SCHEER/WHO reports, as many other critical reviews, mainly rely on outdated results and therefore don't apply to today's sunbeds and the way they are regulated in the European countries.

Moreover, the latest meta-analysis of research for sunbeds in Europe “did not show an association” with melanoma (OR=1.10; 95%CI=0.95-1.27, p=0.218) (these numbers are considered statistically insignificant due to high P value and showing a reduced risk and an increased risk at the same time). In addition, the recent report by SCHEER (Scientific Committee of the European Commission) and WHO report has been discredited in a review paper for being based on “an incomplete, unbalanced and non-critical evaluation of the literature.”

Burgard et al. (2018), Solarium Use and Risk for Malignant Melanoma: Meta-analysis and Evidence based Medicine Systematic Review.

Reichrath et al. (2018), A Critical Appraisal of the Recent Reports on Sunbeds from the European Commission’s Scientific Committee on Health, Environmental and Emerging Risks and from the World Health Organization.

Responsible and moderate sunbed use has a lot of health benefits

To maximize the benefits of UVB and UVA exposure from indoor tanning while minimizing potential risks with overexposure, studies have shown that it is important to use a sunbed in a professional setting and be mindful of the total dose (irradiance and duration), not dose rate (irradiance) alone so burning does not occur.

There have been many case-control studies of melanoma and the use of indoor tanning equipment. A recent meta analysis of 8 credible studies in North America estimated an overall significant odds ratio of 1.23. Three of these 8 studies also reported separately on commercial use and home use of indoor tanning equipment. For home use the overall odds ratio was a significant 1.53 while for commercial use there was a non significant 1.05 (this numbers are considered statistically insignificant due to high P value and showing a reduced risk and an increased risk at the same time). This shows that it is not the sunbed that’s the problem, it is the person controlling the equipment. Industry certified operators should be mandated.

Hoel (2016), Commercial tanning salons and melanoma risk.

McKenzie & Lucas (2018),

Reassessing Impacts of Extended Daily Exposure to Low Level Solar UV Radiation.

Further information can be found in the [ESA International Factsheet on Sunbeds](#)