Sunbeds inactivate bacteria and viruses

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According to DIN 5031-10: 2018, microorganisms (bacteria, viruses, algae, mold, ...) can be inactivated with short-wave UV. This relates in particular to the use of very short-wave UVC. Inactivating means either killing or preventing the DNA from reproducing.

Interestingly, the action spectrum for inactivation has a very broad course, which extends up to 310nm into the UVB and thus into the natural spectrum of the sun on the earth's surface. However, the sun can only bring these short-wave UVB components up to the earth's surface through the atmosphere when the sun is high. In winter and the autumn and spring months, this component of the sun's radiation simply does not penetrate through the atmosphere.

Beside temperature and humidity causes, the lack of UVB is one reason why we tend to catch bacterial or viral inflammation mostly in the winter months: the bacteria and viruses simply live longer because the available natural sunlight cannot harm them. There lifespan is much longer than in summertime.

A second effect of this lack of spectral components in the darker months (in our latitudes from mid-October to the end of February) is the lack of the possibility of producing vitamin D through sunlight. Vitamin D is known for its cell protective effects. The low vitamin D levels in the population at the end of winter are well known.

UVB thus has three positive effects on humans:

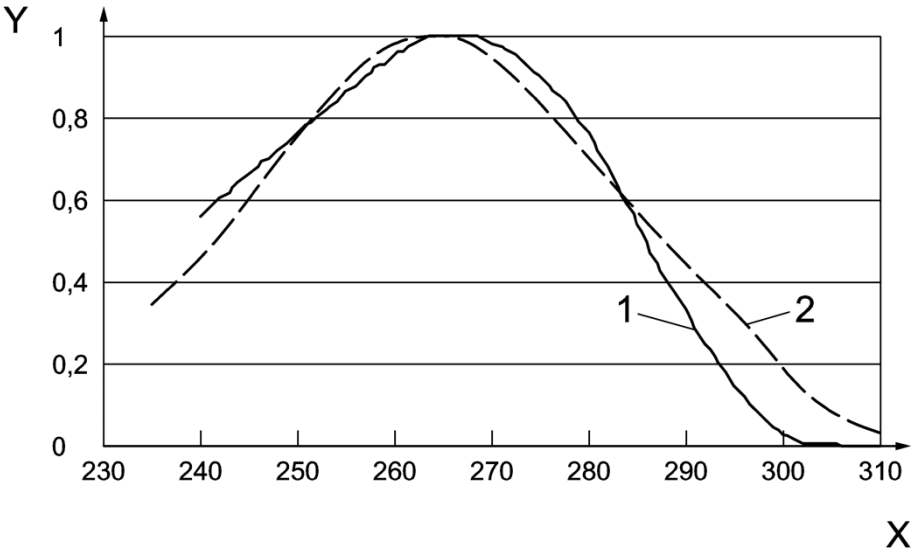
- Reduction of microorganisms on objects and the skin
- Formation of vitamin D in the skin
- Formation of pigments in the skin, which create a natural protection of the skin against excessive UV in sunlight

Sunbeds emit the full summer sun spectrum all year round and can also inactivate bacteria and viruses in this way. The responsible spectral range is made available anyway for the formation of new pigments and for the production of the vitamin D, protecting the cells.

According to our calculations based on the values of DIN5031-10: 2018 for typical sunbeds providing 2% UVB, 90 - 99% of the bacteria and viruses on the skin (at least coli bacteria and influenza viruses) should be deactivated on the skin within a normal solarium tanning session of 10 - 30 minutes. Sunbeds therefore have a protective effect rather than a negative effect against the Corana virus.

Background

We do not have an exact action spectra on the inactivation of Corona viruses yet. But we have the action spectra on microorganism from DIN5031-10

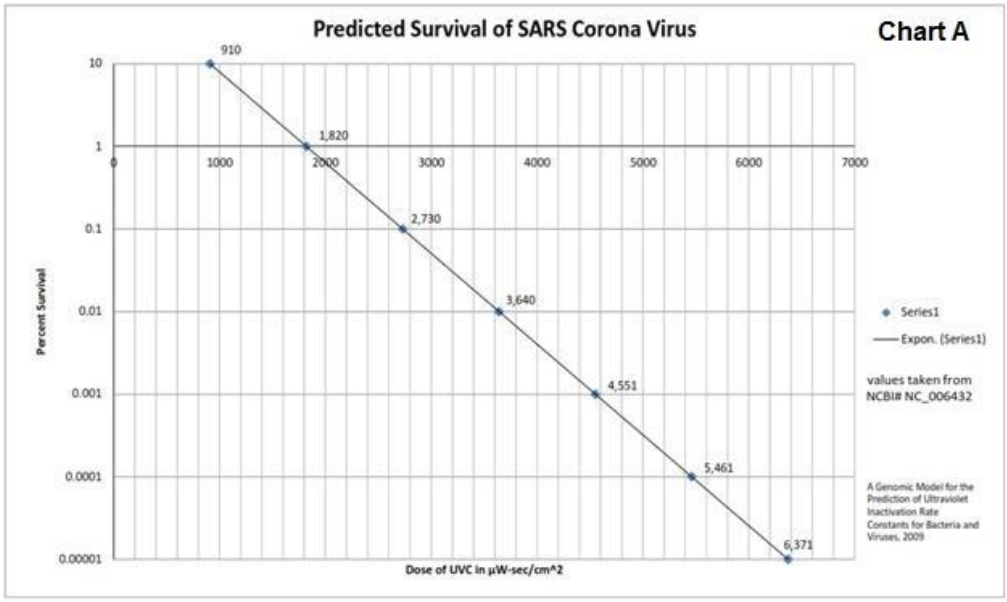


X - Wavelength λ in nm
Y - spectral action factor
1 - $A_{ia1}(\lambda)$ after DIN 5031-10:2000 model 1
2 - $A_{ia2}(\lambda)$ after DIN 5031-10:2000 model 2
Action spectrum for inactivation of Escherichia coli bacteria $A_{ia1}(\lambda)$ and $A_{ia2}(\lambda)$

and the knowledge that UVC inactivates the Corona virus identically to the influenza virus[1]. Since the action spectrum for inactivation of microorganism is more or less identical to the action curve of DNA damage, it seems to be logical that this inactivation is identical for all microorganisms.

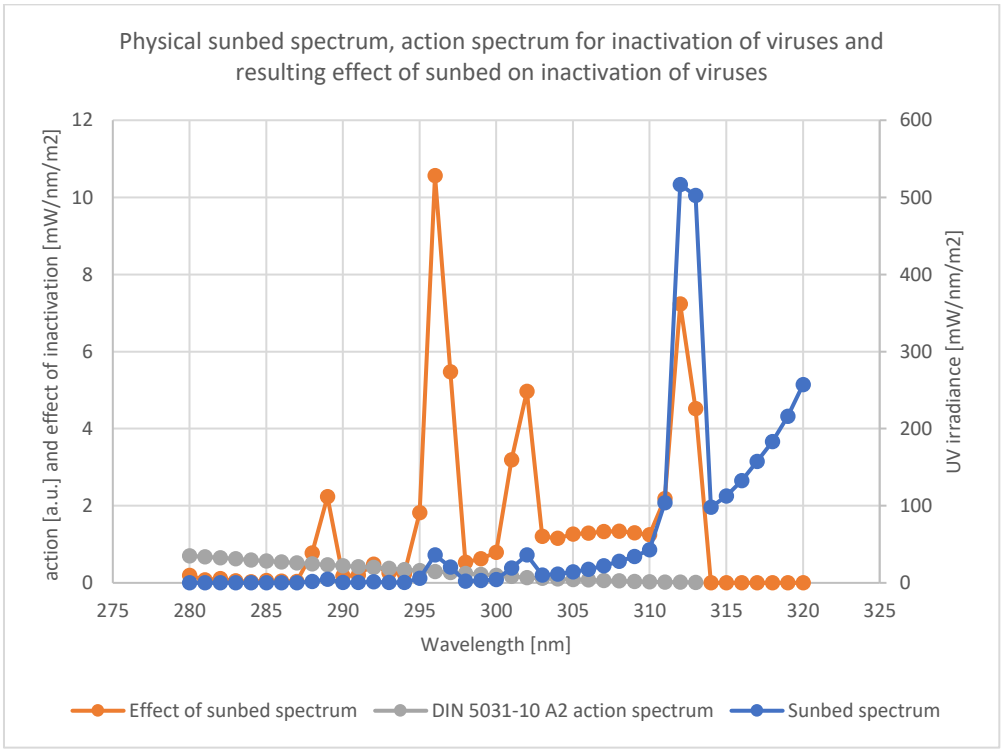
The dose for inactivation of Corona with 253nm is identical to that for influenza (see chart A) and it is very likely that the effect of longer wavelength, especially UVB is identical for all microorganism.

[1] Inactivation of Enveloped Viruses (Coronavirus, H5N1 Virus) and Disinfection of the Air with Legionella-X 100 Via Ultraviolet Germicidal Irradiation (UVGI), Nelson Cheng , Patrick Moe , Benjamin Valdez Salas, Ernesto Beltrán-Partida, Nicola Radnev Nedev, Autonomous University of Baja California-UABC (attached)



Source: Sterile-Aire.com

Therefore, the inactivation rate can be calculated by using the action spectrum for inactivation of microorganisms from DIN5031-10 and the corresponding weighted dose threshold of 27 J/m^2 for 90% inactivation of influenza viruses. We take the physical irradiance of a typical sunbed spectrum, multiply it with the action spectrum nanometer by nanometer and sum up the effect.



With a typical physical irradiance of around 2 W/m^2 UVB an 90% inactivation dose of 27,3 J/m^2 is reached after 10 minutes and an 99% inactivation dose of 36,4 J/m2 is reached after around 14 minutes.