

RADIATION SAFETY NEWSLETTER

UK EH&S, Radiation Safety Office

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RSO Column - Bob Wilson

With the winter season on our minds and psyches, a nice session in a tanning booth may seem appealing. And it can be a real tonic. However, some precautions and considerations are worthwhile. The International Commission on Non Ionizing Radiation Protection (ICNIRP) has recently issued a safety statement on exposure to ultraviolet radiation (UVR) for suntanning.

TANNING APPLIANCES: TYPES AND EMISSION CHARACTERISTICS

Four types of UVR appliances are in common use for tanning. The emission characteristics and the health risks for each type of appliance are different. Type 4 appliances are intended for medical purposes and should not be used for tanning.

- UV Type 1 - appliances emit UV radiation having wavelengths longer than 320 nanometers (nm);
- UV Type 2 - appliances emit UV radiation having wavelengths both shorter and longer than 320 nm, with a relatively high output;
- UV Type 3 - appliances emit UV radiation having wavelengths both shorter and longer than 320 nm, with a relatively limited output; and
- UV Type 4 - appliances are those that emit UV radiation having wavelengths shorter than 320 nm.

EFFECTS ON SKIN

Increasing evidence of long term UVA (315 – 400 nanometer frequency)-induced risks for the skin and the eye has led the sun-tanning industry to increase the UVB (280 – 315 nanometer frequency) content of tanning lamps to more closely simulate natural sun exposure. This change has also permitted shorter tanning exposures. The ratio of UVA to UVB in the solar spectrum changes during the day and according to season and latitude. There is no firm scientific evidence to indicate that tanning with either UVA or UVB dominated sources poses less risk; nor is



the use of a simulated solar spectrum necessarily "safer" than other artificial sources.

Tanning

There are two distinct UVR tanning reactions: Immediate pigment darkening (IPD) begins immediately on exposure to UVR and is caused by the darkening of the pigment melanin in the skin; it begins to fade within a few minutes after the end of exposure. Delayed tanning (neo melanogenesis) results in visible tanning after at least 3 days. Delayed tanning is more persistent than IPD.

An individual's tan depends critically on his/her skin phototype (see Table 1). Persons of skin phototypes I and II are likely to be disappointed with the cosmetic results of a sunbed. Many users experience minor adverse effects such as mild erythema, itching, and skin dryness. Users, as well as attendants at tanning salons, may incorrectly evaluate individual skin sensitivity to UVR and underestimate the user's sensitivity.

Sunburn

Minor sunburn is a skin reddening (erythema) that appears up to 12 hours after UVR exposure. Erythema gradually fades after a few days, replaced by some tanning in individuals with tanning capability. Severe sunburn is painful and results in inflammation, blistering, and peeling of the skin. **Sunburn** severity depends critically on skin phototype and UV dose. For fair-skinned people (skin phototypes I and II), the relative effectiveness of UVR for tanning and for erythema is approximately the same for UVB and UVA.

Skin cancer

The most serious long term effect attributed to UVR exposure is skin cancer. Squamous and basal cell carcinomas are common, rarely fatal forms of skin cancer, which are often referred to collectively as non melanoma skin cancers (NMSCs). Estimates of the risk of incidence of NMSC due to the use of UVA sunbeds suggest a doubling of risk for no more than 20 sessions per year over 30 years. Based upon a modeling of human skin cancer risk, 10 tanning sessions of 30 min per year will increase the risk of skin cancer by 5% compared with non users of solarium.

Cutaneous malignant melanoma (MM), while much less frequent than NMSC, is much more serious and accounts for the majority of deaths from skin cancer. Epidemiological data indicate that intermittent exposure to high levels of solar UVR, particularly at an early age, may be a contributing causal factor. The individual risk of MM is higher in people who have a large number of moles and who sunburn readily and tan poorly. The data all indicate that cumulative exposure, including childhood exposures, increases the risk for skin cancers.

Premature skin aging

There is considerable evidence that cumulative UVR (UVA and UVB) exposure results in premature skin aging characterized by a dry, coarse, leathery, and wrinkled appearance. In a 5 year study of women who used or did not use tanning salons, it was concluded that the unremitting use of sunbeds induces a functional decline of the dermis resembling premature aging.

Table 1. Classification of skin phototypes based on susceptibility to sunburn and to tan

Skin phototype	Sun sensitivity	Sunburn susceptibility	Tanning ability	Classes of individuals
I	Very sensitive	Always sunburn (<2 SED)	No tan	Melano-compromized
II	Moderately sensitive	High (2-3 SED)	Light tan	Melano-compromized
III	Moderately insensitive	Moderate (3-5 SED)	Medium tan	Melano-competent
IV	Moderately resistant	Low (5-7 SED)	Dark tan	Melano-competent
V	Resistant	Very low (7-10 SED)	Natural brown skin	Melano-protected
VI	Very resistant	Extremely low (>10 SED)	Natural black skin	Melano-protected

SED (Standard Erythema Dose)

OCULAR EFFECTS

The cornea

The principal adverse effect of UVR on the cornea is termed photokeratitis ("welder's flash" or "snow blindness"). Damage is generally limited to the epithelial (front surface) cells of the cornea. After a 6 to 12 hour latent period, that depends inversely on the severity of the exposure, there is severe corneal pain, photophobia and tearing. These symptoms are terribly distressing (with incapacitation), but typically resolve in 24 hours.

The lens

Transmission of UVA to the lens is much greater than that of UVB. Certain medicines may act as UVA photosensitizers of the crystalline lens.

The retina

The most important retinal damage mechanism is photochemical injury from short wavelength light. Young children and people who have had a lens surgically removed (aphakes) are at a higher risk of retinal damage from UVR and blue light. Until the last decade, many implanted artificial lens did not effectively absorb UVA. The crystalline lens and cornea serve in considerable measure to protect the retina from most UV tanning booth radiation, even without protective goggles.

Protective eyewear

The use of protective eyewear (goggles) prevents exposure of the eyes to harmful levels of UVR and blue light. This is a very important issue for sunbed exposures, since an individual is normally protected from most of the overhead solar UVR by brow ridge and upper lids shading. The exposure from sunbeds is geometrically greatly different. Oblique rays may be focused more into the eyes. Eyewear that does not incorporate side protection will not provide adequate protection.

CONCLUSION AND RECOMMENDATIONS

A review of scientific evidence shows that solar UVR is a cause of squamous cell cancer, basal cell cancer, and cutaneous melanoma as well as causing accelerated skin aging and other adverse health effects. Because of this evidence of adverse health effects, even though it is not conclusive, it concluded that any use of suntanning appliances is likely to raise the risk of cancer. This risk is particularly high for people having skin phototypes I and II and for children.

The ICNIRP, therefore, recommends against the use of UV emitting appliances for tanning or other non medical purposes. The following groups are at particularly high risk of incurring adverse health effects from UVR, and therefore should be particularly counseled against the use of tanning appliances:

- People who have skin phototypes I or II;
- Children (i.e., less than 18 y of age);
- People who have large numbers of moles;
- Persons who tend to freckle;
- Individuals who have a history of frequent childhood sunburn;
- People who have premalignant or malignant skin lesions;
- People who have sun damaged skin;
- Those who are wearing cosmetics (this may enhance their sensitivity to UV); and
- Persons taking medications (seek medical advice on medications).

PROTECTIVE MEASURES

When we do decide to use suntanning appliances, we can take a number of steps to minimize the risk:

Minimize the number of tanning sessions. For example, regular exposure for phototypes III and IV, melano competent skin, should not exceed two sessions per week with a maximum of 30 sessions per year. An occasional break from the

regularity of exposure is advisable. Manufacturers or dealers must supply exposure schedules based on the tanning device lamp characteristics. Because the sensitivities of individuals vary greatly, it is advisable to limit the duration of the first session to about one half of a regular session in order to establish the user's skin response. If, following the first session, any adverse reaction occurs, further use of the sunbed should be discouraged. Products designed to enhance or accelerate tanning should not be used. Tanning devices should have an appropriate timer. Because of their possible misuse, unattended or coinoperated tanning devices should not be used. By the nature of their use, sunlamps in the home are not subject to the same degree of control as those used under proper supervision in commercial outlets, so additional safety information should be provided by the vendor or supplier of the tanning device.

FURTHER READINGS

American Academy of Dermatology. Position Statement on Indoor Tanning. *Dermatology World*; March 1999.

U.S. Food and Drug Administration. Policy on maximum timer intervals and exposure schedule for sunlamps. August 1986; FDA Rockville MD, USA.

Radiation Safety Office Bits and Pieces

Monthly Inventory Reports – Thanks to everyone for doing a good job in getting the Monthly Radioactive Material Inventory Reports to us. However we have a recurring situation of people not including the name of the AU, or any name, with the report. If the name is left off, we can't credit you for the report. Please endeavor to always include the AU's name. Thanks much from Tracy and Cindy.

Another “Little” Thing –

As soon as your group receives new radiation badges, promptly gather and send in all the old badges. Don’t wait unduely (maybe someone is coming back from vacation or a meeting in a few days). This really helps with the badge reporting turn-around time and gets the results available to you much sooner. This includes all badges, rings, double badge sets, everything.

Lost and Late Badges –

What do you think about levying a \$50 fee on those that lose badges? The cost for this is growing, when it should not even exist.

Cindy Says –

We need to keep up-to-date on changes in AU office addresses, phone numbers, room numbers, email, etc., as moves to new buildings are made. We need this for mailing and contact purposes. Everyone naturally informs us of the LAB changes so that they can get exits done and clearings for their move, but we need the AU office changes as well.

BASIC RADIATION SAFETY TRAINING COURSE SCHEDULE, 2003

Tuesday, April 15	HS 504, HSLC	1:00 – 4:00
Wednesday, May 14	HS 214, HSLC	9:00 – 12:00
Wednesday, June 18	HS 214, HSLC	1:00 – 4:00
Thursday, July 17	HS 214, HSLC	9:00 – 12:00

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