

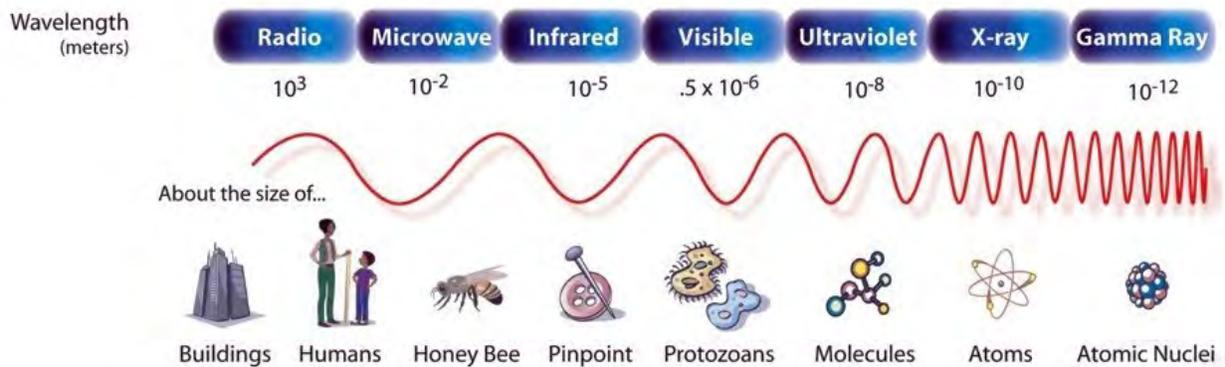


Health Physics Society  
Specialists in Radiation Safety

## Tanning and Ultraviolet Light

### General

The process of darkening the skin by exposure to light is generally called tanning. Ultraviolet (UV) light is invisible to the human eye and causes most tanning and skin damage. Scientists have shown that when UV light is absorbed by our skin, there is damage to our cells and our DNA, which can lead to skin cancer and other harmful outcomes; in general, the more UV light exposure, the higher the risk.



Courtesy of NASA and the American Society for Photobiology

### Ultraviolet Radiation

The electromagnetic radiation spectrum, displayed above, shows the various types of electromagnetic energy, of which UV light is one of many. UV light has a short wavelength (measured in nanometers, nm, where one nm is one billionth of a meter). It is considered nonionizing, which means it doesn't have quite enough energy to remove an electron from an atom, but sits very close to the ionizing forms of radiation such as x rays and gamma rays. UV light is produced by the sun and special types of light bulbs. Scientists have grouped UV light into three main types based on its wavelength: UV-A, UV-B, and UV-C.

**UV-A (315–400 nm).** Approximately 90–95% of solar UV light that reaches the earth's surface is UV-A. It has the longest wavelength and contributes to a number of health effects such as sunburn, skin aging, eye damage, skin cancer, and suppression of the immune system.

**UV-B (280–325 nm).** The remaining 5–10% of solar UV light is UV-B. Exposure to UV-B can result in sunburn, snow blindness, immune-system suppression, skin cancer, and premature aging. While UV-A exposure is highly reduced on a cloudy day, UV-B is not reflected or attenuated (that is, reduced in intensity) by clouds and exposure remains high regardless of cloud cover.

**UV-C (180–280 nm).** A negligible amount of UV-C reaches the earth's surface because it is blocked by the atmosphere and ozone layer. It is generated by special light bulbs and germicidal lamps to destroy bacteria and other organisms. It is harmful to the skin because it damages nucleic acid in cells.

## ***Biological Effects and Risks of UV Light Exposure***

The process of tanning begins when the skin cells react to protect themselves from the harmful effects of the UV light. This method of protection is the increased production of the pigment known as melanin, which is responsible for our hair color and skin color. Melanin in part helps protect the skin by absorbing the UV light (Brenner 2007). The more frequent the UV light exposure, the more melanin is produced in the skin cells, and the darker the skin. Production of melanin (and therefore tanned skin) is the result of your skin being damaged by UV light. People with naturally fair skin are more susceptible to health effects from UV light received during tanning either indoors or outdoors; however, **skin cancer occurs in people of all skin tones.**

Short-term exposure to UV light results in sunburns, tanning, scarring, and fragile skin. Repeated exposures to UV light may result in wrinkles; sagging skin; loss of elasticity; spotting of the skin called age, sun, or liver spots; and skin cancer. Exposure to UV light can also damage the eyes, causing cataracts.

### **Skin Cancer Warning Signs**

1. Skin abnormality that increases in size and appears multicolored.
2. A mole that changes color, changes texture, grows, or becomes irregular in shape.
3. Spots or growths that continuously bleed, itch, hurt, or scab.
4. Any open sore that does not heal in four weeks or heals and reopens.

The risk of skin cancers may increase following exposures to UV light and is a serious concern for those individuals who spend significant time outdoors or who frequent indoor tanning facilities. UV light exposure at an early age is a significant risk factor for developing melanoma (the most severe type of skin cancer) in future years. Tanning bed use increases the risk of developing melanoma of the skin by approximately 75% when use starts before the age of 30 (Tranh et al. 2008; Roebuck et al. 2018). It is for this reason the World Health Organization (WHO) has recommended and the US Food and Drug Administration (FDA) has mandated that labels on tanning beds state the product should not be used by anyone younger than age 18.

Fortunately, UV light does not penetrate deep into the body and there is little or no risk to internal organs, sperm, or an embryo/fetus. The risk of developing cataracts, however, is significant. This underscores the importance of wearing sunglasses with UV light protection while outdoors.

There are a number of medications and cosmetics that may make the skin more sensitive to UV light and damage such as antidepressants, antibiotics, birth-control pills, high blood pressure medications, and others, as well as certain cosmetics and soaps. Thus, health risks from UV light exposure are increased when taking such medications or using such cosmetics.

Because skin cancer risk from tanning is a significant public health concern, consumers need relevant information to make wise choices regarding tanning. There are more than a million new cases of skin cancer each year, and the number of new cases will likely increase if indoor and outdoor tanning increases. Tanning beds do not provide a “safe” tan. A Working Group of the International Agency for Research on Cancer (IARC), a component of the WHO, has classified UV-emitting tanning devices as “carcinogenic to humans” (IARC 2009).

### **Summer Sun Safety Tips**

1. Practice 30:30! Apply sunscreen of at least SPF 30 prior to sunlight exposure and at least 30 minutes prior to swimming.
2. Reapply sunscreen every two hours—more frequently if you’re swimming or sweating. Consider setting your phone alarm to remind you!
3. Carrying a backpack or beach bag? Those straps can rub the sunscreen off your shoulders. Reapply!
4. Wear a hat and UV-protectant sunglasses to protect your face and eyes!

**The WHO, American Cancer Society (ACS), FDA,  
and Centers for Disease Control and Prevention (CDC)  
all recommend avoiding indoor tanning.**

### ***UV Light and Vitamin D***

While it is true that UV light is used by the body to produce vitamin D, only a small amount of this UV light is necessary for the body to maintain healthy vitamin D levels. Many times, the body obtains this vitamin D through the food we eat and any vitamin supplements we may take. Specific questions about vitamin D deficiency should be directed to your local physician.

### ***Regulations***

In the United States, the FDA regulates all tanning-bed manufacturers. The FDA requires warning labels regarding minimum age for usage, skin types, and eye protection. The FDA's specific regulations regarding sunlamps, tanning booths, and tanning beds can be found in the resources listed at the end of this article.

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