

**CANSA Fact Sheet
on
Solar Radiation and Skin Cancer**

Introduction

Solar radiation is more than the light and heat that we perceive from the sun. The sun is a star, and it produces energy in many forms, from perceptible heat, visible and invisible spectrums of light, radiation, and more. Life on earth would be impossible without the sun, but our atmosphere also protects us from the more dangerous aspects of solar radiation.

[Picture Credit: Solar Radiation]



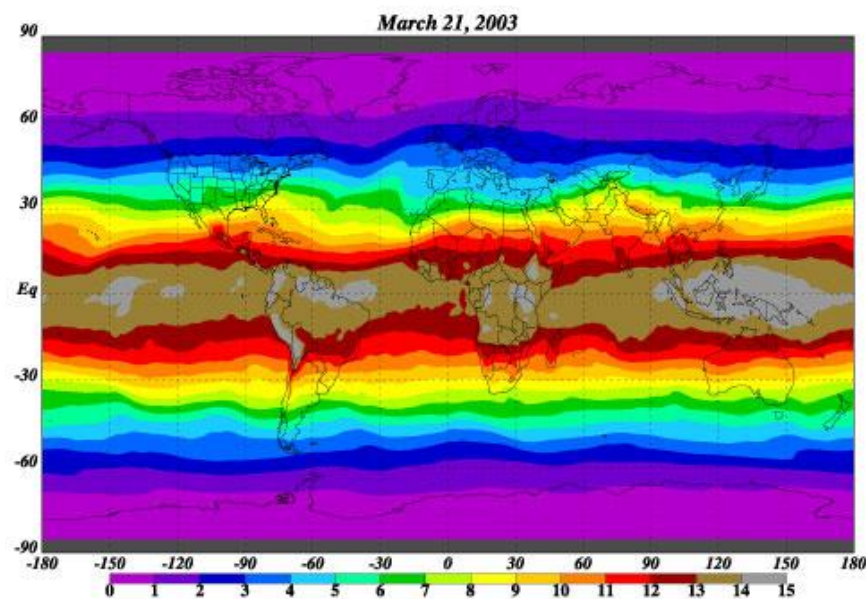
Solar radiation is electromagnetic energy emitted by the sun, comprising ultraviolet, visible, and infrared light, which acts as the primary energy source for Earth's atmospheric, geological, and biological processes. Averaging 1.4 kW/m² at the top of the atmosphere, it drives climate, photosynthesis, and renewable energy technologies like photovoltaics.

Solar radiation is thermal radiation emitted from the surface of the sun, which is powered by nuclear fusion. It is radiant energy emitted by the sun which comprises mostly of electromagnetic energy. About half of the radiation is in the visible short-wave part of the electromagnetic spectrum. This is the part of light that can be seen by the human eye. The other half of solar radiation is mostly in the near-infrared part, with some in the ultraviolet (UV) part of the spectrum.

The Sun is the centre of our galaxy both literally and figuratively. The sun is approximately 149 million kilometres away, sending its energy to the Earth in about 8 minutes. This energy is a combination of both light and UV rays. Known as a yellow dwarf star in the astronomy world, the sun is busy converting hydrogen to helium at its core by way of nuclear fusion. The result of this action is energy

Solar radiation and sunlight make it possible for the earth to house life (NASA). The negative aspects of our relationship with the sun are primarily the result of human irresponsibility: we develop skin cancer when we ignore our bodies' signals to avoid sunlight, while we rather struggle with global warming because we have ignored the environmental concerns of our actions. When we do not give solar radiation the respect it deserves, we are literally playing with fire.
(US Department of Energy, 2026).

World Ultraviolet Radiation Map



[Picture credit – World UVR Map]

Eckhardt, L.D. 2025.

“The author provides a literature review examining the clinical risks of cosmic radiation exposure and incidence of cancer in aircrews including pilots, flight attendants, and flight engineers or navigators. The review focuses on ionizing radiation exposure in aircrews as an occupational working group. The author will discuss the types of cancer associated with cosmic ionizing radiation exposure and the prevalence of certain cancer types noted in this population. Monitoring of ionizing radiation of aircrews in the United States is not required in 2024, which makes assessing exposure a challenge. The author also discusses associated risk factors and prevention strategies in aircrews. United States aircrews are an occupational group with known elevated exposure to ionizing radiation from natural cosmic sources, which has been linked to health risks, particularly for cancer. This occupational group is not monitored in 2024 and would benefit from occupational exams for medical surveillance and hazard awareness.”

Gilaberte, Y., Piquero-Casals, J., Schalka, S., Leone, G., Brown, A., Trullàs, C., Jourdan, E., Lim, H.W., Krutmann, J. & Passeron, T. 2025.

“The skin microbiome undergoes constant exposure to solar radiation (SR), with its effects on health well-documented. However, understanding SR's influence on host-associated skin commensals remains nascent. This review surveys existing knowledge on SR's impact on the skin microbiome and proposes innovative sun protection methods that safeguard both skin integrity and microbiome balance. A team of skin photodamage specialists conducted a comprehensive review of 122 articles sourced from PubMed and Research Gateway. Key terms included skin microbiome, photoprotection, photodamage, skin cancer, ultraviolet radiation, solar radiation, skin commensals, skin protection, and pre/probiotics. Experts offered insights into novel sun protection products designed not only to shield the skin but also to mitigate SR's effects on the skin microbiome. Existing literature on SR's influence on the skin microbiome is limited. SR exposure can alter microbiome composition, potentially leading to dysbiosis, compromised skin barrier function, and immune system activation. Current sun protection methods generally overlook microbiome considerations. Tailored sun protection products that prioritize both skin and microbiome health may offer enhanced defense against SR-induced skin

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conditions. By safeguarding both skin and microbiota, these specialized products could mitigate dysbiosis risks associated with SR exposure, bolstering skin defense mechanisms and reducing the likelihood of SR-mediated skin issues.”

Conflict of interest statement

YG, SS, GL, HWL, JK, and TP have received honoraria from ISDIN. JPC is a consultant for ISDIN. AB, CT, and EJ are employed by ISDIN who financed the publication expenses.

Classification of Electromagnetic Energy

The electromagnetic spectrum is divided into several parts:

- *Electric Power* – electric power covers the low-frequency, long-wavelength end of the spectrum. It is usually ducted along 2-wire and 3-wire transmission lines and is what we use to power up items in our homes.
- *Radio Waves* – radio waves are generally utilised by antennas of reasonable size, so their wavelengths range from hundreds of metres to about one millimeter. The different parts of the radio spectrum are called bands. Television (TV), mobile phones, wireless networking and amateur radio all use Radio Waves.
- *Microwaves* – microwaves are waves which are typically short. It is produced with Klystron and Magnetron tubes. Microwaves are absorbed by molecules that have a dipole moment in liquids. In a microwave oven, this effect is used to heat food. Low-intensity microwave radiation is used in Wi-Fi. An average microwave oven in active condition is, in close range, powerful enough to cause interference with poorly shielded electromagnetic fields such as those found in mobile medical devices and cheap consumer electronics.
- *Infrared Radiation* – the infrared part of the electromagnetic spectrum covers three main parts:
 - Far-infrared
 - Mid-infrared
 - Near-infrared
- *Visible Radiation (Light)* - after infrared comes visible light. This is the range in which the sun and stars, similar to it, emit most of their radiation. The different colours that the human eye can see all have a different wavelength.
- *Ultraviolet (UV) Light* – this is radiation of which the wavelength is shorter than the violet end of the visible spectrum. Being very energetic, UV can break chemical bonds, make molecules unusually reactive or ionize them, in general changing their mutual behaviour. Sunburn, for example, is caused by the disruptive effects of UV radiation on skin cells, which can cause skin cancer by damaging the complex DNA molecules in the skin cells. The sun emits a large amount of UV radiation, which could quickly turn earth into a dead desert, but most of it is absorbed by the atmosphere’s ozone layer before reaching the surface of the earth.
- *X-Rays* – hard X-rays (highest energy X-rays) are of shorter wavelength than soft X-rays (low energy X-rays). X-rays make it possible for us to ‘see’ through some things and not others, as

well as for high-energy physics and astronomy. Black holes and neutrons emit x-rays, which enable us to study them.

- *Gamma Rays* – these are the most energetic photons, having no lower limit to their wavelength. They are useful to astronomers in the study of high-energy objects or regions and find a use with physicists thanks to their penetrative ability and their production from radioisotopes (WordIQ.Com).

(National Aeronautics and Space Administration, 2013; Siyavula, No date; Britannica, 2026).

Health Effects of Ultraviolet Radiation

Small amounts of UV are beneficial for people and essential in the production of vitamin D. UV radiation is also used to treat several diseases, including rickets, psoriasis, eczema and jaundice. This takes place under medical supervision and the benefits of treatment versus the risks of UV radiation exposure are a matter of clinical judgement.

Prolonged human exposure to solar UV radiation may result in acute and chronic health effects on the skin, eye and immune system. Sunburn (erythema) is the best-known acute effect of excessive UV radiation exposure. Over the longer term, UV radiation induces degenerative changes in cells of the skin, fibrous tissue and blood vessels leading to premature skin aging, photodermatoses and actinic keratoses. Another long-term effect is an inflammatory reaction of the eye. In the most serious cases, skin cancer and cataracts can occur.

Between 2 and 3 million non-melanoma skin cancers, e.g. basal cell carcinomas and squamous cell carcinomas, are diagnosed each year, but are rarely fatal and can be surgically removed. Approximately 130,000 malignant melanomas occur globally each year, substantially contributing to mortality rates in fair-skinned populations. An estimated 66,000 deaths occur annually from melanoma and other skin cancers. Worldwide some 12 to 15 million people become blind from cataracts annually, of which up to 20% may be caused or enhanced by sun exposure according to WHO estimates. Furthermore, a growing body of evidence suggests that environmental levels of UV radiation may suppress cell-mediated immunity and thereby enhance the risk of infectious diseases and limit the efficacy of vaccinations. Both act against the health of poor and vulnerable groups, especially children of the developing world. Many developing countries are located close to the equator and hence, people are exposed to the very high levels of UV radiation that occur in these regions.

It is a popular misconception that only fair skinned people need to be concerned about overexposure to the sun. Darker skin has more protective melanin pigment, and the incidence of skin cancer is lower in dark skinned people. Nevertheless, skin cancers do occur with this group and unfortunately, they are often detected at a later, more dangerous stage. The risk of UV radiation-related health effects on the eye and immune system is independent of skin type.

(World Health Organization, 2024).

The Ultraviolet Index (UV Index)

The UV Index represents the amount of skin-damaging ultraviolet radiation reaching the earth's surface at any instant of time. The basic UV Index forecast is usually given for solar noon – the sun's

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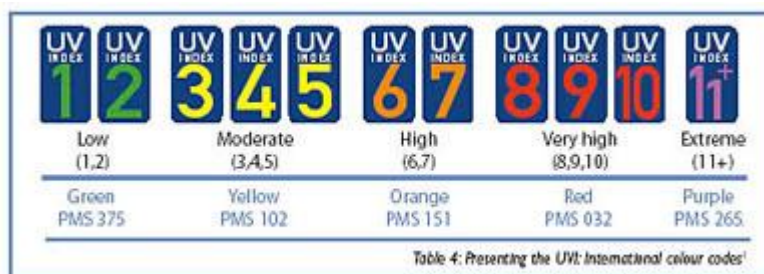
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highest point in the sky and the time of the highest fluctuation in UV radiation under clear sky conditions.

The UV Index Scale is divided as follows:

- 0 to 2** A UV Index reading of 0 to 2 means low danger from the sun's UV rays for the average person (Green)
- 3 to 5** A UV Index reading of 3 to 5 means moderate risk of harm from unprotected sun exposure – stay out of the sun between 10:00 and 16:00 – apply sunscreen – at least 20SPF (Yellow)
- 6 to 7** A UV Index reading of 6 to 7 means high risk of harm from unprotected sun exposure – make sure to apply sunscreen at least 10 minutes before going into the sun – one should stay out of the sun between 10:00 and 16:00 – apply sunscreen – at least 20SPF (Orange)
- 8 to 10** A UV Index reading of 8 to 10 means a very high risk of harm from unprotected sun exposure – stay out of the sun between 10:00 and 16:00. Stay out of the sun – remember that UV rays can reflect from water surface, tiles next to the swimming pool as well as sand on the beach (Red)
- 11 and above** A UV Index reading of 11 or 11+ means extreme high risk of harm from unprotected sun exposure – stay out of the sun between 10:00 and 16:00 (Purple)



(World Health Organization, 2022;

Global Burden of Disease from Solar Radiation

In 2006 the World Health Organization (WHO) has recently published a report entitled "Global burden of disease from solar ultraviolet radiation" that provides detailed estimates of UV-associated disease burden worldwide. Using established methodology and best available estimates on UV-related mortality and morbidity, this report estimates that annually around 1.5 mill DALYs (Disability-adjusted life years) are lost through excessive UV exposure. The report gives region, age and sex-specific estimates and includes detailed methodological considerations. A counterfactual zero population exposure to UV would generate a substantial burden of disease through diseases of vitamin D deficiency. This, however, is only a theoretical possibility since the large majority of people is casually exposed to UV radiation such that extremely low Vitamin D levels are rarely found (World Health Organization, 2006).

(World Health Organization, 2006).

How to Protect Yourself Against UV Radiation

How to Protect Yourself Against UV Radiation					
					
	UV Rating 1-2 Low	UV Rating 3-5 Moderate	UV Rating 6-7 High	UV Rating 8-10 Very High	UV Rating 11+ Extreme
Use UV-blocking Sunglasses					
Use Sunscreen at least SPF50					
Wear a Broad Rimmed Hat					
Wear Sun-protective Clothing					
Stay in the Shade					
Reduce Time In the Sun					
Avoid the Sun Between 10:00 – 16:00					

[Picture Credit:
Sun Graphic
FreePik. 2026.

Long Sleeve Shirt
Pot Plant Club. 2026.

Sunglasses Graphic
OTTICAIT. No date.

Shade Tree
PNGTree. 2026.

Sunscreen SPF50
Design Bundles. 2026.

Sitting under Umbrella
Vistacreaste. 2026.

Broad Rim Hat
Novel Tees. No date.

Direct Sun
Total Installer. 2026.]

Reflected Ultraviolet (UV) Radiation

Many surfaces, especially light-coloured, shiny, or natural materials, reflect UV radiation and increase one's UV exposure, with fresh snow reflecting up to

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80-88%. Other highly reflective surfaces include water (10-30%), sea foam (25%), dry sand (15-25%), and concrete (25%). These surfaces can cause sunburns even in the shade.

Key Reflective Surfaces Include:

- Lawn grass, summer/winter 2.0% – 5.0%
- Wild grasslands 0.8% – 1.6%
- Soil, clay/humus 4.0% – 6.0%
- Sidewalk, light concrete 10.0% – 25.0%
- Sidewalk, aged concrete 7.0% – 25.0%
- Asphalt roadway, new (black) 4.1% – 5.0%
- Asphalt roadway, old (grey) 5.0% – 8.9%
- House paint, white, metal oxide 22%
- Aluminium, dull, weathered 13%
- Open water 30.3%
- Sea surf, white foam 25% – 30%
- Beach sand, wet 7.1%
- Beach sand, dry, light 15% – 25%
- Snow, fresh (2 days old) 88%

Rain Umbrella lets through 30% of UV radiation.

(World Health Organization, 2016; Sun Safety at Work, No date).

Information Around the 'Why' and 'How' of Being SunSmart

There are two main kinds of Vitamin D—Vitamin D₂ and Vitamin D₃ which one can get from certain foods like salmon, tuna, mackerel, beef, liver, and egg yolks where it occurs naturally; however, because not all humans consume large enough quantities of these foods, they may not acquire sufficient amounts of Vitamin D. That is why sun exposure and foods like milk, cereal, and some orange juices are Vitamin D₂- and D₃-fortified.

The body requires sunlight to produce Vitamin D. Ultraviolet B (UVB) rays convert 7-dehydrocholesterol, (a compound called cholesterol) in the skin's epidermis, into pre-vitamin D₃. This UVB-initiated process is the primary natural source of Vitamin D, which is essential for calcium absorption, bone health, immune function, and reducing risks of chronic diseases.

Another way to get Vitamin D is by taking supplements. These come in both pill and liquid form. They are generally recommended for people with fat absorption issues, lactose intolerance, and milk allergies, as well as for people with darker skin tones or with certain medical conditions that prevent them from going outdoors. One should consult with a healthcare professional to determine the need and appropriate dosage for a particular individual.

Individuals with insufficient sun exposure - including people with disabilities, infants, the elderly, dark-skinned people, and those who live at either northern or southern latitudes

during the winter – may be at risk of low Vitamin D₃ production, which can lead to a loss of bone density and an increased risk of fractures.

Persons with disabilities and infants are often less likely to go outdoors, and people over the age of 70 do not produce Vitamin D₃ from their skin as effectively as others. As for people with darker skin tone, they have more melanin in their skins, so less UV light gets absorbed to create Vitamin D₃. They may need more sun exposure to produce sufficient Vitamin D₃ than those with lighter skin.

After vitamin D is absorbed through the skin or acquired from food or supplements, it gets stored in the body's fat cells, where it remains inactive until needed. Through a process called hydroxylation, the liver and kidneys turn the stored Vitamin D into the active form the body needs (called calcitriol).

Is it best to get all one's Vitamin D from the sun? Definitely not. There are claims that it is essential to get a certain amount of direct sun exposure every day in order to produce enough Vitamin D to be healthy. This is just not true. The majority of people can get sufficient Vitamin D from nutrition, fortified foods and supplements.

There are two schools of thought around what time of day is the best for sun exposure.

One school of thought advocates that because the sun is most potent for Vitamin D synthesis during midday, one should aim for short periods (4 to 8 minutes) of sun exposure between 10 am and 2 pm to maximise Vitamin D production. In case that this is the individual's choice, it is best to expose the following skin areas: such as arms and legs. One should start with shorter periods of sun exposure and gradually increase the duration to about 8 minutes at a time to allow one's skin to adapt and minimise the risk of sunburn.

The other school of thought believes that one should expose one's skin to sunlight during a daily walk or some other form of outdoor physical activity in the early morning (before 10:00) or late afternoon (after 16:00) and to keep one's face, arms, and hands exposed to the sun (also one's legs if possible). It is recommended that one should expose the skin to direct sunlight for a maximum of about 10 to 15 minutes. It is, however, important to avoid direct sunlight between 10:00 and 16:00 or whenever UV levels are high. At these times, use protection such as:

- shade
- clothing that covers your arms legs and body
- a hat that shades your face, ears and neck
- a broad spectrum (UVA and UVB) sunscreen of at least SPF (sun protection factor) 30
- sunglasses — preferably wrap around and labelled as 100% protective against UVA and UVB rays.

Because the fat cells in the human body, can store Vitamin D for months, one does not need to worry if there are days when one cannot get enough sun exposure. The body will still be safe from the detrimental bone effects of low vitamin D if one gets enough sun other days.

Getting enough Vitamin D is vital for one's bones, but one needs to keep tabs on the process. It sounds like a major chore but performing regular skin checks to monitor for any changes, such as new moles or unusual spots, is crucial in preventing skin cancer. It is also crucial to keep the ABCDE acronym in mind!

For South Africa, one can check daily UV levels on Afriwx (<https://afriwx.co.za/>).

One should take additional precautions in the event of a UV Index of 6 and higher. (Bickle, D.D. 2025; Healthline, 2023; National Osteoporosis Foundation of South Africa, 2026; Yale Medicine, 2026).

Incidence of Skin Cancer in South Africa

According to the latest edition of the National Cancer Registry (2023) the following cases of skin cancer were histologically diagnosed in South Africa during 2023:

Group 2023	Type of Skin Cancer	Actual Number of Cases	Estimated Lifetime Risk	Total of All Cancers
All Males	Basal Cell Carcinoma	8 191	1:26	19,64%
All Females		6 568	1:47	14,23%
All Males	Squamous Cell Carcinoma	4 449	1:52	10,66%
All Females		3 323	1:110	7,20%
All Males	All forms of Melanoma including Melanoma of the skin	1 186	1:161	2,82%
All Females		1 111	1:279	2,41%

Please refer to the different Fact Sheets for information on the various skin cancers. They can be viewed at www.cansa.org.za.

Ultraviolet (UV) radiation is electro-magnetic radiation of a wavelength shorter than that of the visible region (that which the human eye can see) of the electromagnetic spectrum. The name means 'beyond violet', violet being the colour of the shortest wavelengths of visible light.

The sun emits UV radiation in the UVA, UVB, and UVC bands, but because of absorption in the atmosphere's ozone layer most of the ultraviolet radiation that reaches the earth's surface is UVA (WordIQ.Com). In general, UVA contributes to the ageing of skin, DNA damage and possibly even skin cancer (Suntan.Com). It penetrates deeply and does not cause sunburn.

While ultraviolet B (UVB) rays, the main cause of sunburn, are the strongest in the summer, ultraviolet A (UVA) rays remain constant throughout the year. UVA rays account for up to 95 percent of the UV radiation reaching the Earth's surface. Although they are less intense than UVB, UVA rays are 30 to 50 times more prevalent, and go through glass, making sun protection necessary indoors as well as out.

A new study in 2010 by researchers at NYU School of Medicine found that UVA radiation damages the DNA in human melanocyte cells, causing mutations that can lead to melanoma. Melanocytes, which contain a substance called melanin that darkens the skin to protect it from the ultraviolet rays of the sun, are more vulnerable to UVA radiation than normal skin cells because they are unable to repair themselves efficiently (ScienceDaily).

UVB radiation has been linked to skin cancers including melanoma. Researchers at The University of Texas M. D. Anderson Cancer Center have found that the risk of developing melanoma, the deadliest form of skin cancer, is only partially associated with exposure to ultraviolet B (UVB) radiation, the rays in sunlight that increase in summer and cause sunburn (ScienceDaily). The radiation ionises DNA molecules in skin cells and, thereby, damaging the DNA.

UVB radiation is also responsible for the formation of Vitamin D within the epidermis of the skin from pro-vitamin D3.

South Africa has the second highest incidence of skin cancer in the world after Australia as far as Caucasians are concerned. The good news is that skin cancer can be prevented by respecting the sun. The three most common types of skin cancers are basal cell carcinoma (BCC), squamous cell carcinoma (SCC) and malignant melanoma (Skin Cancer Foundation, 2026).

Skin Cancer

There are three types of skin cancer:

[Picture Credit: Skin Cancer]



Basal Cell Carcinoma - Basal cell carcinoma, or basal cell skin cancer, is the most common form of cancer.

Most skin cancers are basal cell cancer. Basal cell carcinoma starts in the top layer of the skin called the epidermis. Most basal cell cancers occur on skin that is regularly exposed to sunlight or other ultraviolet radiation. This includes the top of your head, or scalp.

Basal cell skin cancer is most common in people over age 40. However, it occurs in younger people, too.

One is more likely to get basal cell skin cancer if one has:

- Light-coloured or freckled skin
- Blue, green, or grey eyes
- Blond or red hair
- Overexposure to x-rays or other forms of radiation
- Many moles
- Close relatives who have or had skin cancer
- Many severe sunburns early in life
- Long-term daily sun exposure (such as the sun exposure people who work outside receive).

Squamous Cell Carcinoma - Squamous cell carcinoma (SCC) is the second most common type of skin cancer. It begins in the squamous cells, which are found in the upper layer of the epidermis (skin). Fortunately, SCC is curable in 95% of cases if detected early.

SCC primarily develops in fair-skinned, middle-aged and elderly people who have had long-term sun exposure. SCCs may also occur where skin has suffered certain kinds of injury: burns, scars, long-standing sores, sites previously exposed to X-rays or certain chemicals (such as arsenic and petroleum by-products). In addition, chronic skin inflammation or medical conditions that suppress the immune

system over an extended period of time may encourage development of the disease. Finally, those who have been diagnosed with skin cancer previously are at a greater risk of recurrence. There are numerous less common risk factors for SCC as well.

Malignant Melanoma - Malignant melanoma currently accounts for approximately 1% of all cancer deaths. However, the worldwide incidence of melanoma is increasing at a faster rate than any other neoplasm, with the exception of lung cancer in women.

South Africa has one of the highest incidences of malignant melanoma in the world as far as Caucasians are concerned (at least similar to that of Australia). To date, we do not have accurate statistics, but the 2009 figure for the Cape is 69 new cases per year per population of 100 000 Caucasians, compared to 65 per 100 000 for Australia. This translates to one in 1 429 people developing a malignant melanoma. From 1990 to 1995, this figure was 22,2 per 100 000 for females and 27,5 per 100 000 for males. In the period 2000 – 2003, this rose to 33,5 per 100 000 for females and 36,9 per 100 000 for males (South African Melanoma Advisory Board).

Melanoma can affect all ethnic and racial groups; however, the typical melanoma patient has a fair complexion and a tendency to sunburn rather than tan, even after a brief exposure to sunlight. Although there is no conclusive evidence that exposure to sunlight is causally related to the development of melanoma, lesions are most commonly found on sun-exposed areas of the body. Other epidemiologic risk factors include the occurrence of a previous melanoma and an afflicted first-degree relative (parent or sibling) (Cancer News).

There is a definite link between the occurrence of breast cancer and melanoma. A link has recently also been established between certain prostate cancers and melanoma ((Mayo Clinic, 2019).

The ABCDE Warning Signs

The following ABCDE warning signs apply:



[Picture Credit: ABCDE Warning Signs]

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A-symmetry - a mole or mark with one half unlike the other - common moles are round and symmetrical

B-order irregularities - scalloped or poorly defined edges - common moles have smooth and even borders

C-olour variations and inconsistency – tan, brown, black, red, white and blue - common moles are usually a single shade of brown or black

D-iameter - larger than 6 mm

E-volving – changes in shape, colour or border of a mole

High Risk Exposure

Everyone is at risk of getting skin cancer, although people with darker skins are less susceptible because their skin contains more natural melanin that protects against sun damage. People with fair skin, especially those with red hair, moles or skin spots as well as people with a personal or family history of skin cancer, or who play sport outdoors, work in the sun or spend a lot of time driving, are considered high-risk.

At least 80% of sun-induced skin damage occurs before the age of 18 and only manifests later in life. Therefore, it is imperative to take special care of children in the sun, whether it is at the pool, on the beach, at play or at school. Babies younger than one year should never be exposed to direct sunlight. When it comes to protecting the young ones, mothers of babies and toddlers; educators and caregivers can play an important role.

Skin Types

People of skin of colour comprise the majority of the world's population and Asian subjects comprise more than half of the total population of the earth.

The most obvious ethnic skin difference relates to skin colour which is dominated by the presence of melanin. The photoprotection derived from this polymer influences the rate of the skin aging changes between the different racial groups. However, all racial groups are eventually subjected to the photoaging process.

Generally, Caucasians have an earlier onset and greater skin wrinkling and sagging signs than other skin types and in general increased pigmentary problems are seen in skin of colour although one large study reported that East Asians living in the U.S.A. had the least pigment spots.

Changes in skin biophysical properties with age demonstrate that the more darkly pigmented subjects retaining younger skin properties compared with the more lightly pigmented groups. However, despite having a more compact stratum corneum (SC) there are conflicting reports on barrier function in these subjects. Upon a chemical or mechanical challenge, the SC barrier function is reported to be stronger in subjects with darker skin despite having the reported lowest ceramide levels. Barrier function relates to the total architecture of the SC and not just its lipid levels.

Asian skin is reported to possess a similar basal transepidermal water loss (TEWL) to Caucasian skin and similar ceramide levels but upon mechanical challenge it has the weakest barrier function.

Differences in intercellular cohesion are obviously apparent. In contrast reduced SC natural moisturising factor levels have been reported compared with Caucasian and African American skin. These differences contribute to differences in desquamation, but few data are available.

One recent study has shown reduced epidermal Cathepsin L2 levels in darker skin types which if also occurs in the SC could contribute to the known skin ashing problems these subjects experience.

The frequency of skin sensitivity is quite similar across different racial groups but the stimulus for its induction shows subtle differences. Nevertheless, several studies indicate that Asian skin may be more sensitive to exogenous chemicals probably due to a thinner SC and higher eccrine gland density. There is still more to learn and especially about the inherent underlying biological differences in ethnic skin types.

The most commonly used scheme to classify a person's skin type by their response to sun exposure in terms of the degree of burning and tanning was developed by Thomas B. Fitzpatrick*, MD, PhD.

One can use the following skin-type charts for self-assessment of one's skin type by adding up the score for each of the questions that have been answered. At the end there is a scale providing a range for each of the six skin-type categories. Following the scale is an explanation of each of the skin types. One can quickly and easily determine which skin type one has. (DermNet, 2012).

Genetic Disposition of Skin

Score	0	1	2	3	4
What is the colour of your eyes?	Light blue, Grey, Green	Blue, Grey, Green	Blue	Dark Brown	Brownish Black
What is the natural colour of your hair?	Sandy Red	Blond	Chestnut / Dark Blond	Dark Brown	Black
What is the colour of your skin (non-exposed areas)?	Reddish	Very Pale	Pale with Beige tint	Light Brown	Dark Brown
Do you have freckles on unexposed areas of your skin?	Many	Several	Few	Incidental	None

Total Score for Genetic Disposition of Skin: _____

Reaction of Skin to Sun Exposure

Score	0	1	2	3	4
What happens when you stay in the sun too long?	Painful redness, blistering, peeling	Blistering followed by peeling	Burns sometimes followed by peeling	Rare burns	Never had burns
To what degree do you turn brown?	Hardly or not at all	Light colour tan	Reasonable tan	Tan very easy	Turn dark brown quickly
Do you turn brown within several hours after sun exposure?	Never	Seldom	Sometimes	Often	Always
How does your face react to the sun?	Very sensitive	Sensitive	Normal	Very resistant	Never had a problem

Total Score for Skin Reaction to Sun Exposure: _____

Tanning Habits

Score	0	1	2	3	4
When did you last expose your body to sun (or artificial sunlamp / tanning cream)?	More than 3 months ago	2-3 months ago	1-2 months ago	Less than a month ago	Less than 2 weeks ago
Did you expose the area to be treated to the sun?	Never	Hardly ever	Sometimes	Often	Always

Total Score for Tanning Habits: _____

Add up the total scores of the three (3) sections to determine your Skin Type Score.

Skin Type Score – Fitzpatrick Skin Type

Score	Skin Type
0 - 7	I
8 - 16	II
17 - 25	III
25 - 30	IV
Over 30	V - VI

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The Six Fitzpatrick Skin Types

Below is a description of the six (6) Skin Types according to the Fitzpatrick Skin Type Scale:

THE FITZPATRICK SCALE

						
	TYPE I	TYPE II	TYPE III	TYPE IV	TYPE V	TYPE VI
BEFORE SUN	Ivory	Fair or pale	Fair to beige, with golden undertones	Olive or light brown	Dark brown	Deeply pigmented dark brown to darkest brown
AFTER SUN	Always freckles, always burns/peels, never tans	Usually freckles, often burns/peels, rarely tans	Might freckle, burns on occasion, sometimes tans	Doesn't really freckle, rarely burns, often tans	Rarely freckles, almost never burns, always tans	Never freckles, never burns, always tans

Skin Type I:

Highly sensitive, always burns, never tans. Example: Red hair with freckles

Skin Type II:

Very sun sensitive, burns easily, tans minimally. Example: Fair skinned, fair-haired Caucasians

Skin Type III:

Sun sensitive skin, sometimes burns, slowly tans to light brown. Example: Darker Caucasians.

Skin Type IV:

Minimally sun sensitive, burns minimally, always tans to moderate brown.

Example: Mediterranean type Caucasians, some Hispanics.

Skin Type V:

Sun insensitive skin, rarely burns, tans well. Example: Some Hispanics, some Blacks

Skin Type VI:

Sun insensitive, never burns, deeply pigmented. Example: Darker Blacks

(Fitzpatrick Skin Types Scale, 2023).

The Meaning of a Sun Protection Factor (SPF)

The SPF 'Sun Protection Factor' listed on a container of sunscreen is a measure of how well the product protects one's skin from the sun's shorter-wave ultraviolet B (UVB) radiation. Technically, it is the ratio of how long one could spend in the sun before burning when one is protected by sunscreen, compared to when one does not have that protection. A common mistake is applying too little sunscreen, which can drastically reduce the effectiveness of the product. About 30g (a palm full) of sunscreen is recommended to cover the entire body, and it should be applied half an hour before sun exposure. One should reapply every two hours if staying outdoors for a long period of time. Applying sunscreen properly is one of the essential recommendations to lower one's risk of developing skin cancer (About.Com).

Here is how SPF – or Sun Protection Factor – works. If it takes five (5) to ten (10) minutes for your unprotected skin to start turning red, using an SPF 20 sunscreen theoretically prevents reddening twenty (20) times longer – about one hour and forty minutes to three hours twenty minutes (two

hours on average). Most sunscreens with an SPF of 20 or higher do an excellent job of protecting against UVB.

All sunscreens bearing the CANSA Seal of Recognition (CSOR) have broad spectrum protection abilities, meaning they protect against ultraviolet A rays (UVA) and ultraviolet B rays (UVB). The CSOR is a guarantee that the manufacturers of these UV protective products have complied with the strict set of criteria developed by CANSA.

(US Food and Drug Administration, 2017; Australian Academy of Science, 2026).

Sun Protective Clothing and Ultraviolet Protection Factor (UPF)

Sun protective clothing is clothing specifically designed for sun protection and is produced from a fabric rated for its level of ultraviolet (UV) protection. A novel weave structure and denier (related to thread count per inch) may produce sun protective properties. In addition, some textiles and fabrics employed in the use of sun protective clothing may be pre-treated with UV-inhibiting ingredients during manufacture to enhance their effectiveness. In addition to special fabrics, sun protective clothing may also adhere to specific design parameters, including styling appropriate to full coverage of the skin most susceptible to UV damage. Long sleeves, full-length trousers, skirts, and dresses, and full collars are common styles for clothing as a sun protective measure.

A number of fabrics and textiles in common use today need no further UV-blocking enhancement based on their inherent fibre structure, density of weave, and dye components, especially darker colours and indigo dyes. Good examples of these fabrics contain full percentages or blends of heavy-weight natural fibres like cotton, linen and hemp or light-weight synthetics such as polyester, nylon, spandex and polypropylene. Natural or synthetic indigo-dyed denim, twill weaves and canvas are also good examples. However, a significant disadvantage is the heat retention caused by heavier-weight and darker-coloured fabrics.

As sun protective clothing is usually meant to be worn during warm and humid weather, some UV-blocking textiles and clothing may be designed with ventilated weaves, moisture wicking and antibacterial properties to assist in cooling and breathability.

UPF (Ultraviolet Protection Factor) represents the ratio of sunburn-causing UV without and with the protection of the fabric, similar to SPF (Sun Protection Factor) ratings for sunscreen. While standard summer fabrics have UPF ~6, sun protective clothing typically has UPF ~30, which means that only 1 out of ~30 units of UV will pass through (~3%).

(The Skin Cancer Foundation, 2025).

About Clinical Trials

Clinical trials are research studies that involve people. They are conducted under controlled conditions. Only about 10% of all drugs started in human clinical trials become an approved drug.

Clinical trials include:

- Trials to test effectiveness of new treatments
- Trials to test new ways of using current treatments
- Tests new interventions that may lower the risk of developing certain types of cancers

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- Tests to find new ways of screening for cancer

The South African National Clinical Trials Register provides the public with updated information on clinical trials on human participants being conducted in South Africa. The Register provides information on the purpose of the clinical trial; who can participate, where the trial is located, and contact details.

For additional information, please visit: <https://pactr.samrc.ac.za/>

Summary for the Average Reader

Solar radiation is a primary cause of skin cancer, with ultraviolet (UV) radiation being the most significant environmental risk factor. Both natural sunlight and artificial sources like tanning beds are classified as Group 1 carcinogens (proven to cause cancer in humans) by the World Health Organization (WHO).

How UV Radiation Causes Cancer

UV radiation damages the DNA within skin cells. If this damage builds up over time and is not repaired by the body, cells can grow out of control and form tumours.

- UVB Rays: These high-energy rays hit the top layer of the skin (epidermis) and directly damage DNA. They are the primary cause of **sunburn** and most skin cancers.
- UVA Rays: These penetrate deeper into the skin (dermis). They generate reactive oxygen species that cause indirect DNA damage and are the main drivers of premature aging (wrinkles and leathery skin).
- Immunosuppression: UV rays can also weaken the skin's immune response, making it harder for the body to detect and destroy developing cancer cells.

Types of Skin Cancer Linked to Sun Exposure

1. Basal Cell Carcinoma (BCC): The most common type, often linked to cumulative, long-term sun exposure.
2. Squamous Cell Carcinoma (SCC): Strongly associated with chronic lifetime exposure; frequently appears on the face, ears, and neck.
3. Melanoma: The most dangerous form, which can spread to other organs. It is often linked to intense, intermittent sun exposure and severe blistering sunburns, especially during childhood.

Key Risk Factors

- Fair Complexion: People with pale skin, freckles, or red/blond hair have less melanin—a natural pigment that provides some protection against UV damage.
- Geographic Location: Risk increases for those living at high altitudes or in sunnier regions near the equator.
- History of Sunburns: Just one blistering sunburn in childhood can significantly increase the risk of developing melanoma later in life.

Prevention and Protection

- Use Broad-Spectrum Sunscreen: Apply SPF 30 or higher to block both UVA and UVB rays.
- Monitor the UV Index: Take extra precautions when the index is 3 or higher, even on cloudy or cool days.

- **Protective Clothing:** Wear wide-brimmed hats, UV-protective sunglasses, and tightly woven fabrics.
 - **Seek Shade:** Especially during peak UV hours, typically between 10:00 and 16:00.
- (AI Overview, 2026).

Medical Disclaimer

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

Whilst the Cancer Association of South Africa (CANSA) has taken every precaution in compiling this Fact Sheet, neither it, nor any contributor(s) to this Fact Sheet can be held responsible for any action (or the lack thereof) taken by any person or organisation wherever they shall be based, as a result, direct or otherwise, of information contained in, or accessed through, this Fact Sheet.



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