

Sun Protection

[Introduction](#)

[Ultraviolet radiation](#)

[Factors affecting UV radiation](#)

[Effects of UV radiation on the skin](#)

[Prevention](#)

[Reading list](#)

Introduction

A suntan is the goal of a summer holiday for many travellers, however, it should be remembered that a tan is the visible effect of damage to the skin from the ultraviolet rays of the sun. This damage may ultimately lead to skin ageing and cancer.

Ultraviolet radiation

Ultraviolet (UV) light is a small component of sunlight consisting of non-visible wavelengths. These UV wavelengths are subdivided into three types: UVA, UVB and UVC.

UVC light is completely absorbed by ozone in the atmosphere. The radiation that reaches us consists of approximately 5% UVB and 95% UVA, although these figures vary according to factors that include the time of day and year, and latitude.

Although UVB light accounts for a small percentage of the overall light, it is these rays that are mainly responsible for sun burn, skin ageing and cancer. UVA light also contributes to skin ageing and is increasingly linked to malignant melanoma.

Factors affecting UV radiation levels

Time of day

The highest levels of UV light are received when the sun is at its highest point in the sky when it has the shortest distance to travel before reaching the earth's surface. This usually occurs between the hours of 10.00 and 15.00 when sun exposure should be kept to a minimum.

Season

UVB and UVA levels vary greatly between winter and summer in temperate regions but are more constant between seasons in areas closer to the equator.

Latitude and altitude

Sunlight has a shorter distance to travel in order to reach the earth's surface in areas closer to the tropics; UV radiation levels will therefore be higher in these areas because there is less dissipation of the rays as they travel to earth. The level of UV radiation also increases with altitude as the atmosphere becomes thinner and there is less absorption of radiation.

Cloud cover and wind

Clouds have less effect on UV radiation levels than they do on temperature because their water content absorbs heat more efficiently than UV radiation. It is therefore possible to experience the damaging effects of the sun on cool cloudy days. A cool wind also has a falsely reassuring effect because UVB levels remain unchanged on windy days.

Surface reflection

White surfaces such as snow or sand reflect UV radiation resulting in more of it reaching the skin and therefore an increased risk of sunburn. Rippling water and rough seas also reflect more UVB radiation than calm open water.

Effects of UV radiation on skin

Some UV radiation is immediately reflected by the skin's surface, but the majority will penetrate the skin. It then passes into tissues and can be absorbed by certain molecules including DNA.

Sunburn

When UV radiation is absorbed by DNA damage to the cell occurs. As a result the cell attempts to repair itself by releasing chemicals. Sunburn is a visible reaction to this repair process. In some cases the damage to the cell is so severe that it dies resulting in skin peeling and blistering.

Sunburn is characterised by erythema, warmth and pain of varying degrees. In more severe cases swelling, blistering and weeping of the skin can occur.

Oral fluids, analgesia and non-steroidal anti-inflammatory medication can be useful in relieving these symptoms.

Skin tanning

Tanning occurs due to the production of melanin in response to stimulation by UV radiation. Tanning may occur immediately due to the darkening of existing melanin, or be delayed until new melanin is synthesised. Melanin is produced in an attempt to protect the skin cells from UV radiation, and is therefore a sign of damaged skin. However, whilst a tan may protect against further burning, it offers no protection against the effects of radiation leading to skin cancer.

Photo-ageing

Photo-ageing is the cumulative effect of skin damage by UV radiation and is caused by both UVB and UVA radiation. The damage causes the skin's structure to deteriorate resulting in the skin becoming drier, rougher and thicker. In some people the skin becomes thin and fragile.

Skin malignancy

Skin cancers occur when skin cells have undergone malignant transformation due to UV radiation damage to their DNA. These cells reproduce independently to the rest of the body and may infiltrate neighbouring tissues or spread via the bloodstream to organs distant from the skin.

Skin cancers are usually treated by surgical excision, although in some circumstances radiotherapy or systemic chemotherapy may be required.

- Basal cell carcinomas

Basal cell carcinomas are the most common form of skin cancer and frequently occur in middle-aged and elderly persons.

They present as slow growing papules or nodules and often have a pearly rolled edge. They rarely metastasise but can cause extensive local destruction.

- Squamous cell carcinomas

Squamous cell carcinomas are the second most common form of skin cancer. These tumours typically present as firm, slightly tender persistent nodules on sun damaged skin.

- Malignant melanoma

Malignant melanomas are the most serious form of skin cancer. There are four clinical types of malignant melanoma:

Lentigo maligna melanoma is a slow growing deeply pigmented lesion. It commonly appears on the face in elderly persons.

Superficial spreading malignant melanoma is a large flat irregularly shaped lesion.

Nodular malignant melanoma is the most aggressive form and presents as a rapidly growing pigmented nodule which bleeds or ulcerates.

Acral lentiginous malignant melanoma presents as pigmented lesions on the palm or sole.

It is thought that a history of childhood sun exposure and intermittent sun exposure are important risk factors for the development of malignant melanoma.

Treatment consists of wide excision of the lesion and chemotherapy or radiotherapy for metastatic disease.

Polymorphic light eruption

Polymorphic light eruption (PLE) is one of a number of sun induced skin rashes due to UVA radiation.

PLE develops within minutes to hours of exposure to the sun when an intensely itchy, red, spotty rash appears. The outbreak can last for a few days or several weeks before gradually subsiding. Most people will experience PLE only on very sunny days or at the beginning of an overseas holiday; but those that are more severely affected may suffer throughout the whole summer.

PLE can be prevented by reducing exposure to the sun and using a high sun protection factor (SPF).

Some sufferers with PLE will require topical steroids.

Prevention

The main method of avoiding UV induced risks is to reduce the amount of exposure to the sun. It is still possible to enjoy the benefits of the sun, but extra precautions should be taken.

Topical sunscreens are the one of the most common methods used to protect skin against the damaging effects of the sun. They contain chemicals that absorb various wavelengths of UV light. Sunscreens are rated by their sun protection factor (SPF). The SPF refers to the relative protection against sunburn that one receives after applying the sunscreen compared to not using it. Sunscreens with higher SPF ratings give higher levels of protection. As an example, if it takes 10 minutes for a person to become sunburned, applying a sun cream with an SPF of 15 means that it will take 15 times as long, or 150 minutes, to develop sunburn. However, SPF only refers to protection against UVB rays, as there is no standard rating available for the assessment of UVA filters. UVA exposure is increasingly linked to long-term skin damage. Sunscreens containing the active ingredients avobenzone or oxybenzone are able to block a broad spectrum of ultraviolet light. Physical sunscreens containing titanium oxide or zinc oxide are also able to reflect both UVA and UVB rays.

- Avoid sun exposure when the sun is at its highest point in the sky (10.00-15.00)
- Always apply a correct amount; most persons apply too little which reduces the effectiveness of the sunscreen. About 2 tablespoons of sunscreen will be needed to protect an average adult; however, the manufacturer's instructions should be followed for individual products.
- Always use a sunscreen with a high SPF (usually 15 or higher). They may need to be used even on cloudy days.
- Sunscreen should be applied at least 30 minutes before exposure to the sun. It should be reapplied about every two hours, and also after swimming and vigorous exercise.
- Sunscreens may be less effective in protecting against UVA rays, it is therefore important to limit exposure to the sun.
- Wear a wide-brimmed hat to protect the head and face.

- Cover as much skin as possible with sun-protective clothing if exposure during peak times is unavoidable.
- Children are particularly vulnerable to the damaging effects of sunlight. Babies under 6 months of age should never be exposed to direct sunlight and young children should always have a high SPF applied.
-

Reading list

Fleming C, MacKie R. Health risks from the sun and solar skin damage (including heatstroke and heat exhaustion) In: Lockie C, Walker E, Calvert L et al. Travel Medicine and Migrant Health. 2000; Harcourt Publishers Ltd, London

Hawk JLM, McGregor J. Understanding your skin: sunlight and skin cancer. 2003; Family Doctor Publications, Poole.

Kumar P, Clark M (eds.) Clinical Medicine 5th edition. 2002; Elsevier Science Ltd.

Medical Letter. Prevention and treatment of sunburn. Med Lett Drugs Ther 2004;46:45-46.

Wang SQ, Setlow R, Berwick M et al. Ultraviolet A and melanoma: A review. J Am Acad Dermatol. 2001; 44: 837-846.

World Health Organization. Global disease burden from solar ultraviolet radiation. Fact sheet No. 305. July 2006. Available at:
<http://www.who.int/mediacentre/factsheets/fs305/en/index.html>