

Protecting your skin against damage caused by the sun

We all enjoy being outside on sunny days; it makes us feel good. However, that same sun exposure can have harmful effects for some people. This can include worsening an already-existing body condition, or a skin condition, or lead to skin cancer.

In this leaflet, we will discuss conditions either made worse, or caused by, sun exposure. Not all light comes from the sun; but in this leaflet, the words sun and light are interchangeable and used synonymously. This leaflet will not discuss skin cancer. Advice for skin cancer is in a separate leaflet.

Understanding sun exposure

All light derives from either the sun, or an energy source, such as the fluorescent tubes used in tanning salon sunbeds and sunlamps. Light can even come from devices such as smartphones (so-called 'blue light'). Light consists of visible light, allowing us to see; and two types of invisible light, which have other effects on the skin. The first type of invisible light is called ultraviolet light; this is responsible for the development of skin cancer. The second is infra-red light, which is responsible for the warm feeling one gets on their skin when facing the sun. Do remember light travels in rays. This means that even if one is sitting in the shade, light bounces off surfaces and ground; this is how we can see in the shade.

Ultraviolet light is further divided into several types. The important ones to note are Ultraviolet A (also known as UVA) and ultraviolet B (UVB). Crudely speaking, UVA is also responsible for wrinkling and making us look older (think of the A in UVA as 'ageing') and UVB is responsible for sunburn (think of the B in UVA as 'burning').

If we are to protect ourselves against the sun, we need to be aware of what types of light cause condition-specific damage, and then need protect ourselves from it.

How can light affect our skin adversely?

Diseases or conditions caused or aggravated by light can be called photodermatoses, or photosensitive disorders. Dividing this further, the main types of photosensitive conditions are listed below:

- **Immunologic photosensitive disorders:** Disorders related to immune reactions caused by light exposure, such as polymorphic light eruption, solar urticaria, and chronic actinic dermatitis, amongst others.
- **Photo-aggravated disorders:** These are pre-existing disorders that are aggravated by light exposure, although they can also occur in the absence of any sun or artificial light exposure. Examples are lupus erythematosus, dermatomyositis, viral infections like cold sores, rosacea, acne, melasma, post-inflammatory hyperpigmentation. A minority of patients with eczema or psoriasis may find that excessive sun exposure worsens their skin, rather than improves it.
- **Drug- or chemical-induced photosensitive disorders:** These are conditions whereby either an external agent, such as an ingested medicine, or cream applied to the skin, reacts with light to cause an effect, or chemicals produced abnormally within the body accumulate and light exposure triggers harmful effects (such as porphyria disorders). Common medicines that may cause reactions are certain antibiotics, oral retinoids, certain types of diuretics. Creams include topical non-steroidal anti-inflammatory and retinoid creams, and chemotherapy creams such as 5-fluoruracil or imiquimod.
- **Metabolic photosensitive disorders:** Conditions caused by a combination of light exposure and metabolic and nutritional disorders, such as pellagra dermatitis (found in vitamin B3 deficiency, carcinoid syndrome and Hartnup disease) and vitamin B6 deficiency.
- **Genophotodermatoses:** These are rare inherited genetic conditions in which damage caused by light exposure cannot be repaired by the body, due to inborn errors, and leads to damage such as increasing the risk of skin cancers. Examples are xeroderma pigmentosum.

Skin cancer, though strictly speaking is not a photo-sensitive disorder, is related to excessive sun exposure. It is dealt with in a separate leaflet.

What about vitamin D?

Vitamin D is very important for health. It is mainly derived from the action of ultraviolet light on our skin, that causes our body to then develop vitamin D, for it to be used.

Studies show that our bodies produce enough vitamin D in much lesser time than it takes to get sun burnt. However, a word of caution is that is impossible to know what safe level of sun exposure is required for an individual person to make adequate levels of vitamin D, without risking skin cancer, or aggravating their skin condition. We would advise 'safe sun exposure' for most people would be approximately 15 minutes and achieved by exposing arms and the face (without using sun-cream); if you are prone to burning quicker, for example, if one were fair-skinned, this time will be shorter. Similarly, for darker skin-types, this time limit is not known. This, however, does not take into account if you suffer with a condition that means any sun exposure will cause you harm.

Do remember that spending more time in the sun does not mean one gets more vitamin D; mechanisms in the body exist to remove excessive vitamin D.

If you have limited exposure to the sun it worth supplementing your diet with foods rich in vitamin D such as fatty fish (such as salmon, tuna, and mackerel) or cod liver oil capsules. Only small amounts of vitamin D are found in beef liver, cheese, and egg yolks. Some types of milk are fortified with vitamin D (check the label). If your exposure to sunlight is very limited, or you have particular risk of low vitamin D, such as being pregnant and or are breastfeeding, are older (greater than 65) or are a young child, have darker skin, wear whole-body coverings or live-in institutions, then the Government recommends taking a 10 microgram (400 iu) vitamin D supplement a day (7 micrograms a day for children 6 months - 5 years) a day, year-round. Your doctor will be able to tell you if you are in at-risk group.

If you are in a particularly very vulnerable group, such as suffering with conditions that worsen with any sun exposure (for example, lupus), or have had previous skin cancer such as melanoma, or are at risk of skin cancers due to an inherited tendency, then your doctor may perform a blood test to check your vitamin D level and prescribe higher strength supplements.

How to reduce the risk of damage caused by sun exposure

Different conditions are affected by light in different ways. Some worsen with immediate sun exposure, others with more prolonged exposure. Others still, such as lupus erythematosus, or polymorphic light eruption, may show the effects several days or weeks after having sun exposure. **Check with your specialist the extent that you may have to take, to reduce any risks. For some people, this is limiting only ultraviolet radiation. Others may need protection from visible light too.**

You may be referred to a specialist Dermatology centre, called a photobiology centre, where photosensitive disorders are investigated. Besides clarifying a diagnosis, helpful information as what type of light you need to avoid and how to reduce risks, specifically for your condition, should be provided.

There is no one way which is perfect, and a combination approach will work best to reduce risks. These are detailed further:

- Limiting sun exposure such as never using sunlamps or tanning salons, or avoiding when the sun is at its peak in the day (between 11am-3pm)
- Wearing ultraviolet protective clothing and eyewear and keeping exposed skin to a minimum.
- Babies until 6 months should be kept out of the sun (suitable sun-creams are available from 6 months onwards; however, babies older than 6 month and small children should have their sun exposure limited)

- Use of sunscreens and sun-blocks to reduce the amount of ultraviolet penetrating into the skin and causing damage.

Do remember protecting against sun exposure is year-round and not just for the Summer months, and applies to both being at home, and abroad.

Using shade and physical blocks

Peak ultraviolet exposure occurs between the hours of 11am to 3pm; these times may be different in more Northern countries. A handy rule is that If your shadow is shorter than you are, seek shade. Try to limit sun exposure during these times.

If sitting in the shade, do remember that ultraviolet radiation can still get to exposed skin; hence, use a combination of methods to reduce your risk. Sitting under a parasol next to sand, the sea or snow will not reduce your exposure significantly and you are still at risk.

Cloud cover does not mean one is protected from ultraviolet light. The best way to think about any sun exposure is if one can see, that must mean there is visible light. If there is visible light, there must also be invisible light, such as ultraviolet, and therefore one is at risk. The degree of risk may be reduced, but it is not zero. Overcast skies will transmit approximately a third of the ultraviolet radiation present when the skies are clear.

Some people will find that even visible light will affect their skin, or UVA exposure through windows or glass, for example, sat in a car, will cause damage. Patients with xeroderma pigmentosum should avoid prolonged fluorescent light exposure or should cover these in UV-protecting film and will need UV-blocking filter films (DermaGard) for their car and home windows. For patients who have porphyria, amber window films will block a particular type of blue light called Soret wavelength, though sometimes more opaque films can be required for home windows (as there a limit on how much opaque

car films can be made). Do be aware that UV-blocking films can lose their protection over time and some may need replacing every few years.

More information for some specific conditions is provided in this leaflet.

What should I wear?

In general, try to minimize how much of your skin is exposed to the sun. Unless you have specially labelled clothing that certifies ultraviolet protection (these are more important for people with skin conditions made worse by the sun or those at particular risk of developing skin cancer such as those with inherited tendencies), general advice would be to:

- Wear a wide-brimmed hat (defined as a brim wider than 7.5 centimetres) that also covers the back of the neck and ears, as these areas are prone to burning and can develop skin cancer just as easily as anywhere else.
- Wear sunglasses that protect against ultraviolet light. Glasses or lenses with a CE mark offer protection in line with European standards.
- Dark clothing offers more sun protection than bright colours
- Choose fabrics that are lightweight but dense, rather than those with a loose or open weave. If wearing these, then wear sun protection cream underneath.
- Wear long sleeve shirts and trousers.
- For some people, they may need to protect their skin by wearing gloves and avoiding sandals or flip-flops. Others, if wearing sandals or flip-flops, should remember to apply sun protection cream to exposed feet.
- Wet clothes greatly lose their ability to protect against ultraviolet.

Sun protection creams (sunscreens)

Sunscreens are creams that are applied to the skin to either reduce the amount of ultraviolet getting through into the skin (also known as organic filters, chemical sunscreens, or sun creams) or stay as a layer on the skin and cause ultraviolet light to bounce off the skin (also known as inorganic filters, physical sunscreens or sun creams,

reflectors, or sunblocks). Which is used depends on preference of look and feel, or, to put simply, the best type is the one you will use again and again.

Sunscreens can come as gels, lotions, or creams. Lotions are good for greasier skin or the face and easier to apply, but more may be needed; creams are good for dry skin; gels are good for more hairy areas. Sunscreen sticks can be useful around eyes, and sunscreen lip balms are good to protect the lips. Remember to apply sunscreen to the tops of ears and the head, and to feet, if exposed.

A good sunscreen will provide protection against both UVA and UVA. Generally, such a product will state it has 'broad-spectrum' protection or will indicate what it protects against. For UVA protection, one should look for high protection, which is sometimes indicated by a Star rating. This should be a rating of 4 stars and above. SPF is related to UVB protection. A minimal SPF should be 30; though some specialists will advise at least 50 (your doctor will guide you). A broad-spectrum sunscreen will therefore have a UVA rating at 4 or more stars and at least SPF 30.

Be aware that for some patients, with specific conditions, e.g., porphyrias, opaque physical sunscreens with titanium oxide, or zinc oxide, and added iron oxide, will protect against a greater spectrum of light (ultraviolet and visible). Dundee cream (made by Tayside Pharmaceuticals) is a reflectant opaque sunscreen that protects against ultraviolet and visible light and can be prescribed on the NHS. It is available in 3 colours and can be mixed to obtain a good colour match with your skin. It is available from Ninewells Hospital Dundee, DD1 9SY Tel: 01382 632052. Micro-ionized titanium oxide and zinc oxide sunscreens do not block out visible light.

Sunscreen should be applied liberally, and often. In general terms, it should be applied to exposed skin, at least every 2 hours. Products that state they are 'all day' or last for more than 2 hours should also be applied regularly as these often do not take into account activities such as swimming, sweating, rubbing or towel drying skin. Equally,

several cosmetic products such as moisturizers or insect repellants have SPF labels; often the SPF number is too low to be very protective and such creams are often rubbed into skin too thinly; they therefore may only protect from walking from door to car or car to office and are not adequate for serious sun protection.

In terms of amounts, studies show that people generally tend to apply less sunscreen than is recommended. Different guides exist to precise amounts, but in general, for the average adult, two shot-glass full, or 6 whole teaspoons, would be adequate (which is more than half a teaspoon of sunscreen to each arm and the face/neck (including ears), and just over one teaspoon to each leg, front of body and back of body. This should be the minimum.

Sunscreens should be applied at least 15-30 minutes before sun exposure, to allow time to dry. They should be applied after swimming or getting wet; remember, for each 20 minutes in the water, more sunscreen will come off, even if labelled as water-resistant. Even more will come off when toweling dry!

Finally, we hear reports of sunscreens being damaging to the environment such as coral reefs. At present, research has not shown any link between the sunscreen used and any environmental risks, though research is still ongoing. Some studies that have shown sunscreen can damage coral reefs have only shown such damage in laboratories and with concentrations of sunscreen that are nowhere near what people actually use. The damage to coral reefs is most likely to be caused by many other factors together.

What about sun protection in skin of colour?

Again, specific limits in dark skin are more challenging as specific conditions have specific requirements. This is compounded by the fact that dark skin takes longer to develop vitamin D; how much longer is unknown and varies with shade-to-shade of dark skin.

Less research has been performed with regards to sun protection for dark skin. What is known though is that all the same measures generally apply. Finding the right sun protection cream is sometimes more of a challenge as mineral sun-blocks may leave a whitish residue on skin that some may find unappealing. Sun-blocks containing titanium oxide and zinc oxide often are tinted and these may be more cosmetically suitable.

Polymorphic light eruption

Polymorphic light eruption, or PLE, is a common, recurrent, abnormal reaction to sunlight. It is induced by ultraviolet light from the sun and artificial sources, such as from sunlamps. Characteristically, the skin rash occurs several hours or days after sun exposure. Exposure can be as little as 10 minutes.

The cornerstone of treatment is protecting against ultraviolet light, using the methods detailed earlier. For patients who find sitting near windows exacerbates their skin, or those who drive often and are near windows, DermaGuard or other protective films can cutdown ultraviolet light and reduce skin symptoms.

Chronic actinic dermatitis

Chronic actinic dermatitis (CAD) is a chronic dermatitis (eczema) that manifests as an itchy rash on sun-exposed skin, due abnormal photosensitivity. What complicates CAD is that often patients may have a pre-existing eczema, or CAD can be complicated by eczema, seborrheic dermatitis, and contact dermatitis. Often, patients with CAD have been living with eczema for years or decades, unaware of the contribution sunlight may be making to their skin.

CAD is exacerbated, in most cases, by ultraviolet light, but in some people, by visible light too. Hence, full sun protection measures including protective window films, are mandated along with other dermatological treatments for the skin. Be aware that sunscreens may sensitize the skin and cause an allergic contact dermatitis; this should

be considered if despite treatments the condition is worsening despite using sunscreens as well as other topical treatments.

Actinic prurigo

Actinic prurigo, or AP, is an uncommon photodermatosis. AP is a chronic and recurrent condition that may in time spontaneously resolve. Ultraviolet light induces this very itchy condition. Similar to PLE, full ultraviolet sun avoidance measures are required.

Solar urticaria

This is a condition that is largely aggravated by both ultraviolet and visible light. Some patients with solar urticaria (SU) may find that artificial sources of visible light may also trigger their skin. In SU, within minutes of light exposure, patients may develop a hive-like ('nettle rash') on light-exposed skin.

Treating SU involves assessing what type of light affects the skin by phototesting in a specialist centre; investigating whether there is an underlying condition or perhaps medicines taken that is triggering the SU; and treatments in the form of antihistamines or other specialist medicines. Light protection has a role in reducing flare or symptoms, particularly in those who have challenging-to-treat SU. Full sun avoidance measures should be used and in those who are also affected by visible light, the use of a mineral sunblock such as Dundee Cream to block both ultraviolet and visible light.

The porphyrias

These are conditions in which, abnormally, a group of chemicals called porphyrins accumulate in the body. There are different types of porphyria disorders; in most, exposure to light, in particular visible light, causes the porphyrins to become 'activated' and cause damage to the skin, and sometimes, internal organs.

Though some types of porphyria may have specific treatments, the general principles of reducing attacks and flares are by strict light protection. As visible light is the concern, normal sunscreens are not effective enough in reducing visible light, so a reflectant

opaque sunscreen is required, such as Dundee cream, or equivalent. In addition, UV protecting window films may reduce enough visible light for some of the porphyrias, but for some of the more severe porphyrias, such as erythropoietic porphyria (EPP), total visible light reduction is required, using amber-coloured films.

Pigmentary disorders

Pigmentary disorders such as melasma (also known as chloasma) and post-inflammatory hyperpigmentation are known to be exacerbated by both ultraviolet and visible light. Hence, apart from usual sun protection measures that will reduce ultraviolet light, visible light must also be specifically catered for. Similar to porphyrias, the only sunscreens that will help in this situation is an inorganic tinted sunblock sunscreen, with titanium oxide and zinc oxide, such as Dundee Cream, or those supplemented with iron oxide.

Can I still enjoy the sun?

It really depends on where on the spectrum of disorders one's condition is. There are some where any sun or unprotected light exposure is harmful, particularly over time, such as xeroderma pigmentosum. There are others where prolonged sun exposure of some sort leads to tolerance and 'hardening' of the skin, allowing one to spend more time in the sun, in a safe, non-cancer risking way, such as in polymorphic light eruption. Your specialist should be able to guide you as to how much sun you can enjoy and keep risks low.