

What's the difference between physical and chemical sunscreens? And which one should you choose?

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Sun exposure can [accelerate aging](#), [cause](#) skin burns, erythema (a skin reaction), skin cancer, melasmas (or sun spots) and other forms of

hyperpigmentation—all triggered by [solar ultraviolet radiation](#).

Approximately 80% of [skin cancer](#) cases in people engaged in outdoor activities are [preventable](#) by decreasing sun exposure. This can be done in lots of ways including wearing [protective clothing or sunscreens](#).

But not all sunscreens work in the same way. You might have heard of "physical" and "chemical" sunscreens. What's the difference and which one is right for you?

How sunscreens are classified

Sunscreens are [grouped](#) by their use of active [inorganic and organic ultraviolet \(UV\) filters](#). Chemical sunscreens use organic filters such as [cinnamates](#) (chemically related to cinnamon oil) and benzophenones. Physical sunscreens (sometimes called mineral sunscreens) use inorganic filters such as [titanium and zinc oxide](#).

These filters [prevent the effects of UV radiation](#) on the skin.

Organic UV filters are known as chemical filters because the molecules in them change to stop UV radiation reaching the skin. Inorganic UV filters are known as physical filters, because they work through physical means, such as [blocking, scattering and reflection](#) of UV radiation to prevent skin damage.

Nano versus micro

The effectiveness of the filters in physical [sunscreen](#) depends on factors including the size of the particle, how it's mixed into the cream or lotion, the amount used and the [refraction index](#) (the speed light travels through a substance) of each filter.

When the [particle size](#) in physical sunscreens is large, it causes the light to be scattered and reflected more. That means physical [sunscreens can be more obvious](#) on the skin, which can reduce their cosmetic appeal.

Nanoparticulate forms of physical sunscreens (with tiny particles smaller than 100 nanometers) can improve the cosmetic appearance of creams on the skin and UV protection because the particles in this size range absorb more radiation than they reflect. These are sometimes labeled as "invisible" zinc or mineral formulations and are [considered safe](#).

So, how do chemical sunscreens work?

Chemical UV filters work by absorbing high-energy UV rays. This leads to the filter molecules interacting with sunlight and changing chemically.

When molecules return to their ground (or lower energy) state, they [release energy](#) as heat, distributed all over the skin. This may lead to uncomfortable reactions for people with skin sensitivity.

Generally, UV filters are meant to stay on the epidermis (the first skin layer) surface to protect it from UV radiation. When they enter into the dermis (the connective tissue layer) and bloodstream, this can lead to skin sensitivity and [increase the risk of toxicity](#). The [safety profile](#) of chemical UV filters may depend on whether their small molecular size allows them to penetrate the skin.

Chemical sunscreens, compared to physical ones, cause more [adverse reactions](#) in the skin because of [chemical changes](#) in their molecules. In addition, some chemical [filters](#), such as [dibenzoylmethane](#) tend to break down after UV exposure. These degraded products can no longer protect the skin against UV and, if they penetrate the skin, can [cause cell damage](#).

Due to their stability—that is, how well they retain product integrity and effectiveness when exposed to sunlight—physical sunscreens may be [more suitable](#) for children and people with skin allergies.

Although sunscreen filter ingredients can rarely cause true allergic dermatitis, patients with photodermatoses (where the skin reacts to light) and eczema have [higher risk](#) and should take care and seek advice.

What to look for

The best way to check if you'll have a reaction to a physical or [chemical](#) sunscreen is to [patch test](#) it on a small area of skin.

And the [best sunscreen to choose](#) is one that provides broad-spectrum protection, is water and sweat-resistant, has a high sun protection factor (SPF), is easy to apply and has a low allergy risk.

Health authorities recommend sunscreen to prevent sun damage and cancer. Chemical sunscreens have the potential to penetrate the [skin](#) and may cause irritation for some people. Physical [sunscreens](#) are considered safe and effective, and nanoparticulate formulations can increase their appeal and ease of use.

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