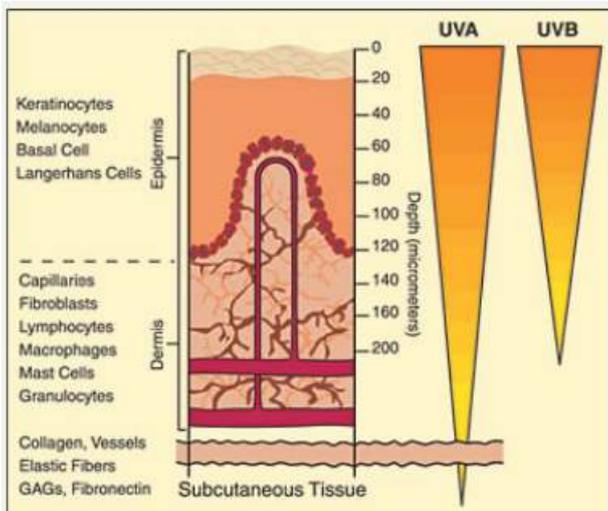


## Sunscreen May Not Prevent Skin Aging!

Recent studies have definitively established that UVA is a cause of skin ageing, and while sunscreens are an important part of any skin cancer prevention strategy, your sunblock may not prevent skin ageing because they are primarily designed to prevent sunburn.

The earth is continually being showered with solar radiation, the electromagnetic energy emitted by the sun. This energy is responsible for sustaining life on our planet and, yet, like many other good things, too much can be harmful. Infrared (IR) visible (VIS) and Ultra Violet Radiation (UVR) are among the total spectrum of radiation that the sun emits: these three command most of our attention



UVR is of most relevance when looking at sunscreen formulations. UVR fraction covers 200nm to 400nm. UVR is in turn, divided into UVC (200nm to 290nm), UVB (290nm to 320nm) and UVA (320nm to 400nm). UVC is very toxic. It is lethal to many microorganisms, such as bacteria, yeasts and protozoa, as well as to most plant life and in addition is carcinogenic to humans. Fortunately, virtually all UVC is filtered out by the ozone layer.

Most UVB is also filtered out. It makes up approximately 1% of the UVR that reaches the earth's surface. However, despite its relatively low presence, UVB is associated with much of the damage caused to humans by sun exposure. UVB has been credited as being the sole cause of sunburn and various skin cancers. It is 100 times more efficient in producing erythema than UVA.

Although UVA is much more abundant, it is much less energetic than UVB and was originally thought to be biologically less significant. However, recent studies have definitively established that the longer UVA is a causative factor in photoageing. It is also the portion of the UVR spectrum most often associated with photosensitivity resulting from drugs or disease. UVA also penetrates the skin to a greater depth than does UVB.

UVA is further divided into UVA II & I (340-400 nm) (320-340 nm) - referred to as long and short UVA respectively. The relatively large amount of UVA and its ability to penetrate deeply into the skin (dermal layer) accounts for its greater significance when establishing cause of skin ageing.

Chemical sunscreens absorb UVR. Example: octyl-methoxycinnamate

Physical sunscreens reflect UVR. Example: Titanium dioxide or Zinc oxide.

Environmental factors naturally play a role in development of photosensitivity, also, clouds and fog scatter longer wavelengths more efficiently than shorter wavelengths. Consequently, although the IR and VIS can be blocked, the UVR - especially the UVB fraction - still passes through. That is why it is still possible to get sunburnt on an overcast day. In fact, UVB radiation values have experienced an average annual increase of more than 6% since the early 1980's.

Sunscreens are an important part of any skin cancer and skin ageing prevention strategy, because they are designed to keep UVR from reaching important structures within the skin, causing damage to the tissues. As knowledge of photobiology grows, it is increasingly evident that marketed sunscreens should block both UVA and UVB. Furthermore, they should block as much of the UVA spectrum as possible. Thus, a formulation will furnish maximum

meaningful protection if, in addition to a high SPF, it provides broad-spectrum coverage. This will necessitate the use of combinations of active ingredients with overlapping or complementary actives like antioxidants, because the total amounts of an individual organic sunscreen that can be used may be limited in the future.

To prevent the formation of pigmentation, a sunblock should contain tyrosinase inhibitors like:

- Liquorice extract,
- Azelaic acid
- Glucosamine
- Vit C, just to name a few

What should a sun protection product be able to do?

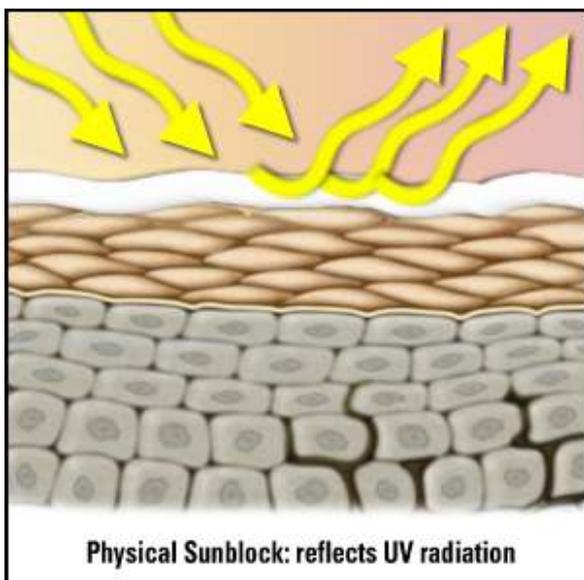
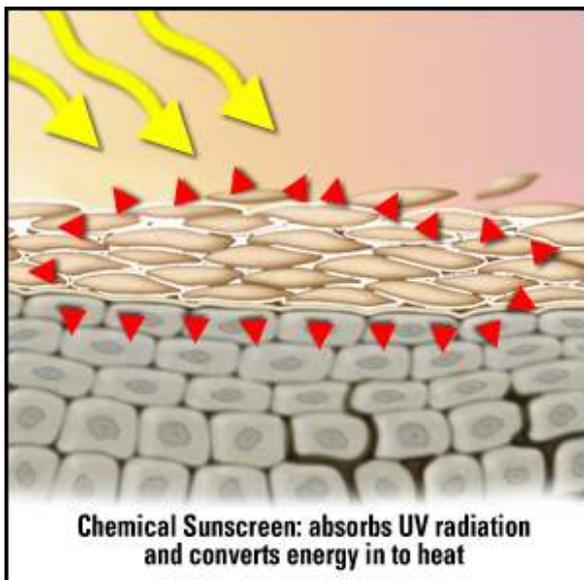
- Offer broad-spectrum protection from sun burn.
- Contain antioxidant ingredients.
- Offer protection to the skin barrier defence system.
- Have an anti-ageing protection profile.

Prevention of an inflammatory effect, such as erythema, does not necessarily imply inhibition of other photo induced skin damage.

### What is the difference?

A question I am often asked is, "How do I know what sort of sunscreen I have? What is the difference?"

Understanding the difference between a physical, chemical, organic or particulate block - these are the words one reads and people often do not understand. In chemistry jargon, it is possible to have several words meaning the same thing. Clarification is important.



### **Chemical / Organic**

Chemical sunscreens absorb UVR

Both mean the same, although the name implies differences. We in the beauty industry usually use the word chemical, and recognise names like octyl-methoxy cinnamate and other almost unpronounceable names.

### **Physical / Particulate:**

Physical sunscreens reflect UVR

Both mean the same: We would usually use the word physical, and would recognise the name titanium dioxide as a physical block.

There are potential difficulties associated with the long-term use of chemical/organic sunscreens, such as allergy and toxicity. Chemical sunscreen actives have been the main stay of photo-protection for decades, mostly used in beach products. Today, however, virtually all types of topical products, from moisturisers to shampoos include chemical sunscreens.

Increased daily exposure to these chemicals will most likely result in the incidence of adverse reactions. The incorporation of sunscreens into daily-use products is beginning to push the existing soluble (chemical) sunscreen to their limit.

Physical/particulate sunscreens offer a way to formulate high SPF products without the addition of extra chemical sunscreens and are fast becoming the first choice. Most domestic retail sunscreens are a combination of chemical and physical. The physical sunscreens of old were white, unsightly, and not cosmetically acceptable for daily protection. With the newer micro-fine particles of zinc oxide and titanium dioxide, women can now enjoy maximum protection, less sensitivity problems and a cosmetically acceptable product.

### **Is this enough to prevent cell damage?**

Epidermal cell damage from sun:

A sun-care product's aim is to prevent erythema, a reaction to acute UVR exposure.

Sun protection products rate efficacy according to SPF, based on the individual minimal sun exposure. (The individual's burn time). The measurement of a minimal dose of Ultra Violet Radiation is a MED. 1 MED. equals the minimal sun exposure (burn time) that will cause redness.

Therefore, if your burn-time is 3 minutes, your protection time with an SPF 15 is three x 15 = 45minutes.

Antioxidants: Oxidative stress, which plays an important part in photoageing and skin cancer, will be decreased by antioxidants. These substances significantly decrease free-radical flux in the skin.

These are just a few of the more commonly known antioxidants found in sun care products available from the beauty therapy industry.

- Tocopherol sorbate
- Ascorbic Acid
- Beta-carotene
- Green Tea Extract
- Oat Extract
- Rosemary Extract
- Retinyl Palmitate polypeptide
- Mulberry Leaf Extract
- Yeast extract

Tyrosinase Inhibitors and Melanin Modifiers: Slow down the unwanted patches of pigmentation that occurs with UVR exposure.

- Green Tea extract
- Yeast
- Mulberry Leaf Extract
- Vit C2
- Liquorice
- Paper Mulberry
- Azelaic Acid and Glucosamine
- Arbutin

What cellular damage occurs with UV Radiation?

It has been inconclusively proven that the skin barrier defence system cells, like the Langerhans cells (LCs) and Keratinocytes (KCs), are both affected by UV Radiation.

Langerhans cells are especially sensitive to UVB, starting at 0.5MED. Causing a decrease in both the total numbers of LCs and their dendrite length, will result in a reduction in the skin barrier defence system.

Keratinocytes will develop, with long-term exposure, an eventual slow-down in cell turnover and a thinning epidermis will cause a decrease in cutaneous barrier toward exo-antigens.

UVB induces free radical formation and DNA damage, the result being the formation of sunburn cells (SBCs) starting at doses below 1 MED.

UVA II & I have the greatest penetration power, and have been linked to the damage of the collagen & elastin support fibres of the dermis. (Skin ageing)

There are a number of ways that the skin can be protected from UVR. Filters and screens that originally found use only in products specifically made for sunburn protection, are now included in daily-use cosmetics and the new generation anti-ageing sun protection products to prevent photoageing.

What should a sun protection product be able to do?

- Offer broadspectrum protection from sun burn
- Contain antioxidant ingredients
- Offer protection to the skin barrier defence system
- Have an anti-ageing protection profile

Beauty therapy daily use cosmetics have all of these protection systems, and are far superior than the older formulated sunblock of the past.

They contain sun-protection profiles, which address all dangers of sun exposure.

Sun protection is currently formulated, evaluated and regulated, in retail sun care products as well as in beauty therapy sun protection cosmetics, according to the ability of sunscreens to inhibit a single, acute manifestation of UV exposure. **Nevertheless, prevention of an inflammatory effect, such as erythema, does not necessarily imply inhibition of other photo induced skin damage.**

The discrepancy between sunscreen effectiveness against erythema and skin barrier defence protection has lead researchers to re-examine sunprotection strategies.

Research is well advanced in labs around the world, that formulate and supply beauty therapy products to our industry. They have been searching for substances that directly protect & support epidermal, and dermal cells - this is called biochemical protection. Instead of just using high SPF/UVR screening materials that protect against erythema, they have included antioxidizing, cell repair/protection, hydration & lipid support and DNA repair agents to reduce cell damage to the product.

Several of the substances below also have an lipid (oil) content that is compatible to the bilayers of the SC. Thus slowing TEWL, therefore raising the hydration of the epidermis.

- EFA's
- Phospholipids
- Ceremides
- Sphingolipids
- Vit C2
- Photonyl
- Phytalluronate
- Milk Cytokines
- Ostar B-Glucan
- Corn Oil Unsaponifiables

Saturation & hydration of the tissue is necessary for full enzyme activity, therefore epidermal hydration is paramount.

Substances that achieve this result, include:

- Hyaluronic acid (HA)
- Sodium Hyaluronate
- Mucopolysaccharides
- Vit C2

Beauty Therapy sun protection products are developed to offer balanced UVR filter use in combination with high antioxidant profiles. The ability to protect the skin's natural immune and UV protection systems, slow and assist in the repair of cellular damage caused by UV Radiation.

#### **Cellular Repair / Protection Agents / Anti Cellular Blebbing:**

A dead cell within an organ is likely to liberate metabolites and debris that might act as chemo-attractants for macrophages. These scavengers are known to engulf and destroy foreign substances by producing hydrogen peroxide, nitric oxide or other activated oxygen species. Since these reactive species are not specifically targeted to the debris, they will react with and damage other molecules in the area once produced and liberated.

If we accept the definition of ageing as the accumulation of un-repaired or unfaithfully repaired damage in molecules belonging to cells - alternatively, to the extra cellular matrix, we can conclude that cell death increases the rate of ageing of an organ, such as the skin.

#### **Hydrating and Emollient Capabilities:**

In addition, the hydration of the dermis is critical for fibroblast formation, which gives us collagen and elastin. These hydrophilic proteins are supported by glycosaminoglycans (GAGS) (Dermal Reserve) 70% of which is hyaluronic acid (HA). The reduction or alteration of HA has been proven in elderly individuals. However, UV exposure, negative work/play lifestyles and actinic damaged skins are also showing a decrease in the levels of glycosaminoglycans. Proving that variation of the levels of hyaluronic acid in the dermis could account for some of the most striking alteration of the aged or sun damaged skins. This would also include decreased turgidity, less support for micro vessels; wrinkles, altered elasticity and thinning skin density.

#### **In Conclusion:**

- Consumers who overuse UVR filters to prevent sunburn are tempted to expose themselves to UVR radiation for longer.
- Given the information that the cell-protection capability of UV filters is lower than their anti-burn action, consumers thus risk damaging their skin's immune defence system and increasing their risk of developing cutaneous cancers.
- Risk of developing sensitisation and photo-sensitisation also comes from over use.
- Using an unnecessarily high SPF than is required may also develop sensitisation and photo-sensitisation.
- Over use of UVR, filters may block Vit D synthesis.
- Concerns are also raised that by the overuse of UV filters, the skin's natural immune & UV defence system becomes inactive or inefficient.

#### **About the Author:**



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