SPF? - So What?

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Legislation has been passed to approve SPF (sun protection factor) ratings to now have a maximum labelling of up to 30+. This will bring Australia in line with international ratings of above 15+. Until now Australian standards required that the maximum SPF rating was 15. So how will this affect all the sun-bronzed Aussie nursery people?

The SPF is a measure of the protection of sunscreens. To arrive at this value the sunscreen had to be tested in laboratory conditions using a solar simulator, with all other variables as constants. The unit measured is the "minimal erythematous dose" or MED, which is a measure of the time taken to produce redness in an average skin. From this the SPF is calculated as:

SPF = MED with sunscreen ÷ MED without sunscreen

In other words, SPF is defined as the exposure time to produce redness on protected skin divided by the exposure time to produce redness on unprotected skin. It is an indicator of the ability of a sunscreen to prolong sun exposure without the danger of sunburn, e.g. for a sunscreen with SPF 15, this would mean that if burning occurs without sunscreen in 10 min then one could expect that with this sunscreen one could have 150-min sun exposure without burning.

Does this mean then, by changing the label of a bottle, that we can stay in the sun for a longer time without any danger? Let's look more closely at the whole issue. Solar radiation is made up of ultraviolet radiation, visible light, and infrared radiation. UV light is divided into three parts, UVA (320-400 nm), UVB (280-320 nm), and UVC (100-280 nm). The ozone layer filters out most of the high energy, damaging rays of the UVC and some of the UVB. While most of the UVA and higher wavelengths are transmitted through the skin, and cause damage in their own way.

For the determination of the SPF rating, a minimum of 10 people, which is a very small sample, with sun-sensitive to normal skins are exposed to artificial light. The light is directed on their backs, with a mixture of protected and unprotected skin areas. Twenty-four hours later they are examined for areas of redness. The artificial light source used is UVB only. How does this equate with reality? Obviously a standard is just that, a standard. It provides a measure. Now let's look at the real situation:

1) The sun has different intensities at different times of the year.
2) UVB is only a very small part of total radiation from the sun.
3) The concentration and choices of ingredients can influence effectiveness of sunscreens.
4) The thickness of the film applied can be variable.
5) Medications can greatly influence burning and sun sensitivity, e.g. sulfonamides, antibiotics, and antihypertensive medications; some cardiac, antidiabetic, tranquillising, and antifungal medications.
6) State of skin — skin integrity, wetness, sweating or rubbing can alter effectiveness.
7) Altitude and latitude are variables — ozone layer depletion now is important.

Table 1. Sunscreen ingredients, their spectrum of activity, the concentration necessary for protection, and some specific properties.

Product	Absorbance (nm)	Concentration	Comment
PABA (para-amino benzoic acid)	260 - 320	5 to 15%	Can stain clothing and cause allergies.
PABA ESTERS Padimate A Padimate O	 290 - 315 290 - 315	 1% to 5% 1.4 to 8%	 Safer to use than PABA. Still can cause allergies.
CINNAMATES Cinoxate	 270 - 328+	 1% to 3%	 Not as sensitising but not as effective as PABA. Ability to penetrate varies on formulation.
SALICYLATES Homosalate	 294 - 315	 4% to 15%	 Sensitisation is rare. In right concentration very effective.
BENZOPHENONES Dioxybenzene	 260 - 380 (UVA UVB)	 3%	 Best when used in combination with other sunscreens
Oxybenzone	270 - 350	2% to 6%	
UVA ABSORBERS Parasol 1789 Eusolex 8020	 360 and above 360 and above		 Must be used in combination with a UVB blocker.
PHYSICAL BARRIERS Zinc oxide	 290 -700	 Enough to cover barrier.	 Cosmetic difficulties, though excellent
Titanium dioxide	290 - 700	3% to 8%	Reflects & scatters UV, visible & IR. Protects & soothes. Excellent product.
Light-weight summer clothing			Some only have SPF of 5 or 7 - even less when wet.

8) Reflection of sunlight is very important, especially by sand, snow, and water.

Short wave UVC is mainly scattered or absorbed before reaching the Earth's surface. However, as the ozone layer thins, we must be aware of the potential harm. UVC is also produced by welding equipment, therapeutic sun lamps, and some quartz halogen lamps.

UVB is recognised as the most harmful of UV radiation causing burning, blistering, initiation of sun cancers, and premature aging. It is also responsible for tanning with the so called "healthy tan" being the bodies damage response to exposure to sunlight. UVB stimulates melanin, hence causing tanning about 10 h after exposure. The epidermis or top layer of the skin also thickens as the body tries to protect itself.

UVA causes premature aging and wrinkling of the skin. It also darkens pigment already in the skin but does not produce new pigment. UVA is used in tanning parlours, promoting tanning without burning. However new research suggests that UVA also contributes to skin cancers not just aging of the skin. It would be very wise to use a sunscreen which adequately controls all UV radiation, not just UVB!.

Sun exposure is a total package — it is a total lifetime accumulation. The damage done in the first two decades of life impacts greatly on the individual and sun tolerance in middle life. Also the greater the amount of burn damage in early life, the more sun-related problems later. This can be in the form of skin aging and precancerous solar keratoses, cancerous conditions such as basal cell carcinoma, squamous cell carcinoma, or malignant melanoma.

Let's see what we can do to minimise the damage. Sunscreens slow the rate at which the electromagnetic energy of the sun is absorbed, by either reflecting, absorbing, or scattering UV rays. This can be done by either physical or chemical means. We need to understand the active ingredients in sunscreens and how best to apply them.

The most common form of chemical sunscreens are UV absorbers which act by penetrating the epidermis and bind in the skin in such a way as to reduce the intensity of sunlight striking the skin. The following is a table of ingredients, their spectrum of activity, the concentrations necessary for protection, and some specific properties.

TIPS FOR APPLICATION OF SUNSCREEN

- Apply up to 2 h before exposure for UV absorbers to give them time to bind onto the skin. Titanium dioxide can be applied just prior to exposure.
- Re-apply while in the sun at regular intervals, but remember that reapplication does not bring you back to the start, it is total cumulative exposure.

If sunburn does happen the best thing to do is cool it with water — not ice, keep up adequate fluid intake, apply mild hydrocortisone cream, and give antiinflammatory medications, e.g. aspirin or ibuprofen (always after food and never if the patient has ulcers or asthma). If blistering has occurred, leave intact if small or, if large gently and aseptically break and treat with chlorhexidine cream. Topical sprays of local anaesthetic are usually ineffective and can cause contact dermatitis.

In conclusion I would like to stress that sun exposure is a total cumulative package. There is some help from sunscreen products but without judicious precautions limiting exposure we can't expect to have a lifetime of trouble-free skin. Let's leave the sunlight to our plants chlorophyll and protect ourselves!

Getting the Message out

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COMMUNICATION THEORY

The diagram in Figure 1 was developed by Berlo (1960) to help explain the process of communication.

SOURCE ⇒	MESSAGE ⇒	CHANNEL ⇒	RECEIVER
Comm. skills	Content	Seeing	Comm. skills
Attitudes	Treatment	Hearing	Attitudes
Knowledge	Code	Touching	Knowledge
Social system	Elements	Smelling	Social system
Culture	Structure	Tasting	Culture

Figure 1. Berlo's model of the process of communication.

The source formulates the message and transmits it via a channel to the receiver. Berlo emphasises the need for the source to be in control of the process and know its pitfalls. For the process to be successful the source must understand the attributes of the receiver in order to select the correct message and channel.

THE SOURCE

The Australian nursery industry pays a levy on all containers used for growing plants for resale and part of this levy is used to fund research and development (R&D) for industry. The Australian Federal Government matches this money $1 for $1 so that in 1997-98 industry had access to nearly $1 M for R&D. Projects are submitted for consideration to, or alternatively commissioned by, the Nursery Industry Association of Australia's (NIAA) Technical Committee and the Horticultural Research and Development Corporation (HRDC).

So the sources of information are HRDC, NIAA, and the R&D providers who are working on levy-funded projects. The R&D providers include mainly government organisations such as the Institute for Horticultural Development, in Victoria. Lets look at the characteristics of the people that work for these organisations.

Researchers often have good scientific written communication skills but poor verbal skills, their attitudes tend to reflect their academic and institutional backgrounds, they commonly possess high levels of specialised knowledge, and their social system and culture tend to be inward looking, focussed on their place of work rather than their clients. This assessment is naturally very broad and there are always exceptions, but I'm sure everyone here has seen elements of these characteristics in researchers they have met.