A hydrogel that may help relieve sunburn pain

Sunburn can be an acutely painful, and sometimes disfiguring side effect of a pleasant day on the beach, as the two patients who participated in the case studies described below discovered. The deleterious effects of repeated sun exposure have been discussed in the literature over the last decade (Foster, 2002). In some cases overexposure to sunlight can cause severe burns.

At present many dressings can offer pain relief at dressing change, but not many provide an analgesic effect at the outset. This article reviews the effect of sunlight on the skin, looks at some means of protection, and reviews the effectiveness of a sheet hydrogel dressing which was used in two patients with sunburn.

Sunburn
Exposure to solar radiation has the beneficial effect of stimulating the cutaneous synthesis of vitamin D and providing radiant warmth. Unfortunately, when the skin is subjected to excessive radiation in the ultraviolet range (wavelength < 400 nm), deleterious effects may occur (Foster, 2002). The definition of sunburn is the damaging effect on the skin of the ultraviolet (UV) light contained in sunlight. UV sunlight is a form of ionising radiation, which means that it can change the structure of molecules (NHS Direct, 2004).

The causes of non-melanoma and melanoma skin cancers are multifactorial and the evidence implicating UV radiation as a significant factor is mounting (Mayling, 2004). Sunlight consists of four important wavelengths. Two of them, UVA and UVB, are the most harmful because they cause direct cellular trauma and immunosuppression (Luttinger, 2001).

Solar erythema is associated with microscopic changes in the skin, detectable within 30 minutes of exposure to UV radiation. The most characteristic changes include formation of epidermal sunburn cells, damaged keratinocytes with hyaline cytoplasm, and pyknotic nuclei (Foster, 2002). Sunburn is a delayed prostaglandin-mediated erythema that implies severe damage to DNA in a cumulative fashion (Liffrig, 2001) and the erythema response to ultraviolet light is a complex reaction involving many biochemical pathways. This reaction, as well as premature ageing and cancer of the skin, can be prevented by regular use of a sunscreen with a sun protection factor (SPF) of 30 (Oppenheim, 2002).

The incidence of sunburn is higher in regions that are closer to the equator, higher in altitude, and have populations with lighter baseline skin pigmentation (Foster, 2002).

Skin cancer is now the most common form of cancer in the UK (Cancer Research UK, 2004). Melanoma is the third most common cancer in people aged 15–35 years (Oppenheim, 2002). There are about 40,000 new cases of skin cancer each year in the UK, 6000 of which are malignant melanomas (De Lima, 2002).

Individuals most at risk of skin cancer include those with lighter skins who burn easily. Such people should use sunscreens with a higher SPF rating (Table 1). A number of preventive measures can be taken to reduce the risks of exposure to the sun:

- Use a sunscreen with a higher than necessary SPF, even if it has a lower UV rating
- Use liberal amounts of sunscreen
- Choose a water-resistant sunscreen when swimming
- Wear protective clothing including hats
- Be aware of heat even in the shade
- Avoid prolonged sun exposure, particularly from 10 am to 2 pm.

McCarthy et al (1999) conducted a survey of sunbathing practices at a Galveston beach on a summer holiday weekend. They found that

<table>
<thead>
<tr>
<th>Table 1. Recommended sun protection factors (SPFs) by skin type</th>
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<tbody>
<tr>
<td><strong>Skin characteristics</strong></td>
</tr>
<tr>
<td>Always burns, never tans, white skin, fair hair, blue or hazel eyes</td>
</tr>
<tr>
<td>Always burns, tans minimally, fair skin, blue eyes</td>
</tr>
<tr>
<td>Burns minimally, tans slowly, darker 'Caucasian' skin</td>
</tr>
<tr>
<td>Burns minimally, tans well, light-brown skin, Mediterraneans</td>
</tr>
<tr>
<td>Rarely burns, tans profusely, brown skin, Middle Eastern, Latin American</td>
</tr>
<tr>
<td>Never burns, always tans, dark brown or black skin SPF none</td>
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</tbody>
</table>

From Foster, 2002.
sunburn increased with longer duration of sun exposure; 100% of subjects experienced sunburn after exposure 24.5 hours. Men exhibited a significantly higher frequency of sunburn, employed fewer sun-protective measures, and demonstrated less knowledge about sun-safety information and skin cancer than women. These findings suggest a need for greater public education (directed at men in particular) about preventing sunburn, in an effort to change attitudes that currently lead to high-risk sunbathing behaviour (McCarth et al., 1999).

In general, clothing is protective and hats help cover highly exposed areas of the body. Special apparel products incorporate UV protection into the fabric and offer an additional strategy for workers and enthusiasts who frequently venture outdoors. A sunscreen is a topical agent that provides protection against UV radiation (Liffrig, 2001). It is often used as a primary strategy to prevent sunburn and later skin cancer. Paradoxically, sunscreen use has been associated with the increasing incidence of skin cancer because of sunscreen failure, particularly after swimming when the protection is washed away (Wright et al., 2001).

Sunburn may lead to the development of premalignant lesions (solar keratoses) and malignant tumors (e.g., basal cell carcinoma, squamous cell carcinoma and melanoma). In addition, sunburn can worsen other skin problems. It can precipitate recurrences of herpes simplex, lupus, porphyria, and other cutaneous disorders, and it can lead to premature ageing and wrinkling of the skin. Other health problems exacerbated by sunburn include dehydration, heat exhaustion and heatstroke. Excessive exposure of the eyes to UV radiation can lead to discoloration of the lens and nuclear cataract formation (Foster, 2002).

Treatment of sunburn
A skin assessment should be conducted to evaluate damage to the skin caused by overexposure to the sun. Skin damage may comprise:

- Minor erythema with slight burning (skin intact)
- Persistent erythema with pain (skin intact)
- Erythema with painful superficial blistering
- Severe blistering with fluid lost.

In rare cases, severe sunburn can result in second-degree burns, dehydration, secondary infection, shock and even death.

Blistering can occur 12-24 hours after sun exposure and is regarded as erythemic skin damage. If the blisters rupture, the damaged area should be bandaged as a superficial, partial-thickness burn requiring pain relief, extra fluids and wound management.

Treatment of overexposure to sun is geared to relief of symptoms (Potts, 1990). Any dressings used should be non-adherent on the wound bed because removal of a 'stuck' dressing can cause pain. Sunburn was contracted with products such as calamine lotion and paraffin roll gauze. More modern dressings may now be used, including soft silicone contact dressings and soft polymer wound contact dressings, which are indicated for superficial skin damage (Gray and Cooper, 2001). But no case studies on the use of these dressings to treat sunburn have been published.

Aspirin and non-steroidal anti-inflammatory drugs have anti-prostaglandin effects and are useful to relieve pain and inflammation, especially when given early. Cool soaks with water also provide temporary relief (Foster, 2002).

In cases of severe sunburn a short course of systemic steroids may shorten the duration of symptoms and reduce pain if given early and in relatively high doses (equivalent to prednisone 40-60 mg per day) (Foster, 2002). Where used, they should only be prescribed for a few days, with no need for a taper (Foster, 2002). In the presence of severe second-degree burns, steroids are best avoided because they increase the risk of infection (Foster, 2002).

**ActiFormCool**

ActiFormCool is a new dressing that may be used in sunburn (Figure 1). It is a sheet hydrogel which, the manufacturer Activa Healthcare (2004) claims, has a cooling and soothing effect on painful tissues and is suitable for superficial burns. This may be an ideal dressing for sunburn because it could cool and soothe the area while keeping the blisters moist.

ActiFormCool comprises a two-sided, clear, transparent hydrogel formed around a blue matrix for stability. Because of its construction the dressing is permeable to water vapours, but...
impermeable to bacteria, and the low-sensitizing preservative makes it suitable for most skin types. The dressing’s high water content, which is not immediately observed because it is contained in a firm gel, offers a cooling effect on the wound and maintains the moisture that is so important to wound healing (Figure 2).

On application of ActiFormCool the initial temporary drop in skin temperature affords an immediate analgesic effect, bathing the nerves in a moist environment which allows pain relief to continue even when normal skin temperature is reached. ActiFormCool was selected for treating sunburn wounds in two case studies because of its potential soothing effect.

Case study 1: Ms A
Ms A is a 24-year-old woman who came to the clinic with sunburn across the shoulders with some blistering and (the blister roof was intact). Ms A described the pain from the sunburn as a burning pain at level 5 on an analogue scale where 1 is no pain and 10 is the worst possible pain. The ActiFormCool was applied.

At the second assessment the pain was 2 on the analogue pain scale. Ms A had found the dressing comfortable. ActiFormCool was easily applied because its slight adherence held it firmly in place, allowing the nurse free hands for securing a secondary dressing. On the third assessment, the pain had reduced to 1 on the analogue pain scale and the burned tissue no longer required a dressing.

Case study 2: Mrs B
Mrs B is a 58-year-old lady with sunburn. She had some partial-thickness wounds that were raw and bleeding with high exudate. These wounds had occurred on the last 2 days of holiday in Majorca where she had been treated by a local doctor with what looked like a single-layer Jelonet and cotton swabs stuck down with adhesive tape. This dressing caused further skin damage and trauma on removal. Anecdotally, Jelonet is commonly used for burns in Europe but, because it can adhere to the wound if left too long, the Jelonet must be removed daily or several layers applied. At the Jelonet had been left on the wound for several days, Mrs B experienced a great deal of pain when it was removed. Mrs B had been prescribed an analgesic co-dydramol for burns pain. She was also takingatenolol and bendrofluamide for essential hypertension.

The clinic had been using Mepitex foam on the wound and this had coped with the exudate but had not eased the pain. The pain was at a level of 8 on the analogue pain scale and was described as both a stinging and burning pain. Because the pain was so intense, the nursing team decided to apply ActiFormCool. Mrs B reported that relief of the pain was instant on application of ActiFormCool.

At the second assessment, the change was significant. The wounds had healed, the pain was 0 on the analogue scale and there was no further need for a dressing. Mrs B was advised to moisturise the skin and use sunscreens when in the sun in future.

Conclusions
Where there is a possibility of sunburn, preventive measures should always be encouraged (Potts, 1995) using appropriate levels of sunscreen and keeping covered with hats and appropriate clothes. Skin damage needs to be treated when it occurs, and the pain may require analgesia. In the two case studies discussed, the pain and the tissue damage was treated with the application of a soothing hydrogel. The moistness of the dressing facilitated an optimum healing environment.

ActiFormCool was an effective dressing in these two cases. These results support an argument for further evaluation of ActiFormCool for use in the treatment of burns and sunburn.

References

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