



SunSoul Inc cofounder **Chris Hawthorne** describes how the sun's light can be filtered through his company's specialised fabric for outdoor wear.

Some of us remember when the sun was considered healthy for our skin, however, for the past couple of decades we have been rightly told that it is responsible for skin cancer and sun damage, causing premature ageing.

Most of us are aware that selected spectra of light are used by medical and cosmetic professionals to treat acne, for skin rejuvenation, skin healing and other applications.

Is sunlight healthy or harmful?

Sunlight has a very broad spectrum, starting in UVB (290nm) and continuing over the visible and infrared range up to 2000nm, with different parts having different effects on human skin. Figure 1 on the opposite page shows the sun's spectrum ranges and their effect on human skin, based on US Federal Drug Administration clearances for different types of light-based devices. The question is how to increase the effect of positive sunlight and eliminate the harmful radiation.

In January of 2005, I attended a conference with Dr Michael Kreindel (one of the pioneers in laser medicine and cosmetics), Dr Mark Gray (a New Zealand dermatologist) and James Bartholomeusz (BSc/BBus) and we had a discussion about light. We arrived at the concept of making an outdoor enclosure from a polymer and impregnating it with a fluorescent pigment that would absorb most wavelengths and amplify a selected range.

Fluorescent Therapeutic Material (FTM) technology was born. The patents were filed and it was decided the first product developed would be a shirt for the treatment of acne. Acne was chosen to prove our principle as definitive lesion counts and lesion size decreases could be accurately measured.

Acne is a problem that affects 70 percent of adolescents and a significant proportion of adults. The therapeutic effect of blue light is well known in medicine, and is actively used by dermatologists and health professionals in skin treatments. Studies have reported significant improvement of acne vulgaris after skin irradiation with filtered light from a broad-spectrum light source. Blue light in the range of 405nm-500nm was shown as an effective and safe solution for the treatment of mild to moderate acne and further studies have shown superior results with a combination of blue and red light. The benefits of sunlight have been known for centuries but the adverse effects of UV radiation have outweighed the advantages of most treatments utilising direct sunlight.

Analysis of the sun spectrum shows a significant proportion of radiation in the blue range (400nm-500nm). Typical sun radiation during the summertime yields approximately 40mW/cm² of light energy, with the blue range yielding 6mW/cm². This amount of blue light energy from the sun is equivalent to the intensity of blue light emitted by light-emitting diode (LED) devices. We felt this energy could be harnessed.

The critical factor in developing the technology was the ability to selectively filter harmful unwanted radiation (UVA, UVB) while amplifying transmission of therapeutic wavelengths (410-500nm).

To develop this technology a new company was established (SunSoul Inc, Canada, www.sunsoul.com). After two years of development, during which more than 400 types of fabrics were tested and special fluorescent pigments developed, the first product was ready.

The proprietary pigment mix not only transmits light at the required 400nm-500nm range (with a peak at 420nm)

but the fluorescence amplified the light by 75 percent. A high level of blue light is transmitted through the FTM material while UV transmission to the skin is minimal. Dr Kreindel calculated that an hour of exposure to direct sunlight when wearing the shirt was equivalent to approximately 20J/cm² of light from a pulsed light device. Treatment regimes were set at a minimum of two hours sun exposure per week for four weeks.

Prototype shirts were developed and the first pilot trial initiated among a group of patients in Brisbane. The initial results exceeded expectations. Acne counts were reduced and some moderate acne scarring was improved.

This improvement in scarring has been postulated to be a direct effect of the transmission of infrared light to the skin in the range of 700 to 1200nm, which is used in medicine for skin healing.

A further pilot study in Adelaide by plastic and reconstructive surgeon Dr Tony Moore yielded significant results. It was demonstrated that the longer a patient wore the shirt in the sun, the better the result. One 15-year-old male recorded a response to treatment described as 'equivalent to that achieved with Roaccutane' (a highly effective prescription acne drug).

Three other studies were completed: by Hong Kong dermatologist Dr Henry Chan, Auckland dermatologist Dr Mark Gray and University of Alberta, Canada, dermatologist Dr Jaggi Rao. Dr Chan's and Dr Rao's studies used a sun simulator, fixed exposure times and

fixed exposure distances, while Dr Gray's study followed the methods used in Dr Moore's pilot study.

Forty-eight patients recorded a statistical improvement in acne appearance. The FTM treatment demonstrated specificity towards active acne lesions, slightly increasing the inflammation before reducing it. Clinical improvement was noted at the two-week follow-up post-treatment cessation. Dr Gray's study demonstrated an average improvement in acne counts of 65 percent, with no variation in the efficacy between adolescent and adult patients. Eighty percent of patients recorded more than 50 percent improvement. In addition to the decrease in acne counts, there was marked reduction of acne inflammation as well as pore size, and improvement in skin texture.

The product is comfortable on the skin, breathes, wicks moisture, has an attractive design and satisfies all the standards of high-quality outdoor clothing. The greatest advantage of the FTM technology is that users with an active lifestyle can benefit from the healthy rays of the sun during their normal daily activity.

We can now safely send patients into the sun for treatment of skin conditions. By the time this article is published, FTM products will be on the market and available in male, female, unisex and hat designs. The first skin rejuvenation shirts (yellow light) will also be available. The future for this technology is very broad and incredibly exciting. **acsm**

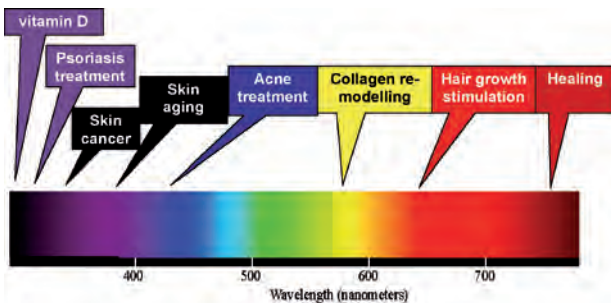


Figure 1: The effect of sunlight on human skin

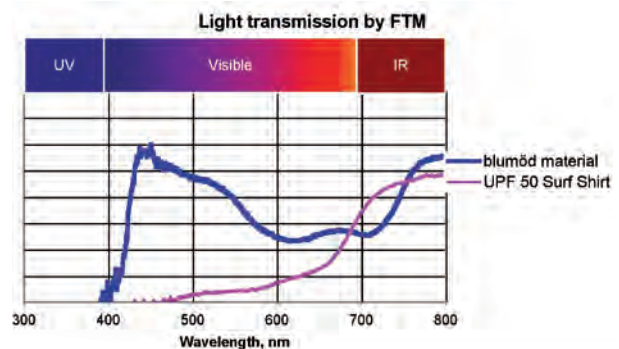


Figure 2: Spectrometer measurements of FTM – fluorescent blue material compared with a standard outdoor shirt, relative to natural sunlight.



BEFORE



AFTER 16-year-old female after four weeks of treatment