SolR™ Understanding Narrowband UVB Phototherapy

"Narrowband" UVB has become the phototherapy treatment of choice for psoriasis, vitiligo, atopic dermatitis (eczema) and other photoresponsive skin disorders. Understanding the benefits of "Narrowband" UVB versus conventional "Broadband" UVB phototherapy requires an understanding of light and the processes it affects.

The spectrum of optical radiation (light) is made up of different wavelengths of "light" ranging from 100 nanometers (nm) in the ultraviolet (UV) range to 1 millimeter (mm) in the infrared (IR) range. Visible light spans from about 380nm (violet) to 780nm (red). Ultraviolet ranges from 380nm down to 100nm, and is further subdivided into UVA (315-380nm), UVB (280-315nm) and UVC (100-280nm).

FIGURE A shows the relative intensities of natural "light" reaching the earth's surface after filtering by the earth's atmosphere. Humans have evolved being exposed to all these wavelengths, so our skin has developed responses to use the light beneficially and to protect us from over-exposure (tanning). "UVB-Narrowband" is highlighted at 311nm and occurs naturally in sunlight, but not in great amounts. The earth's atmosphere filters nearly all light less than 300nm.

FIGURE A

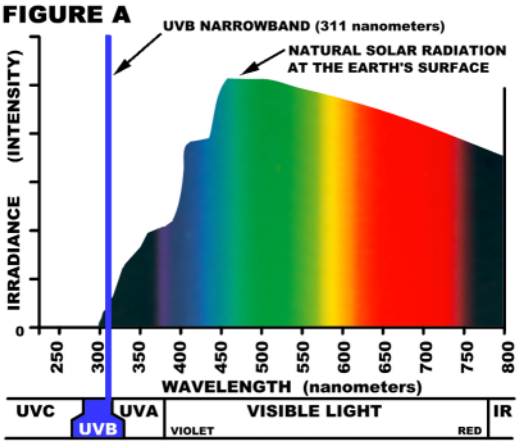
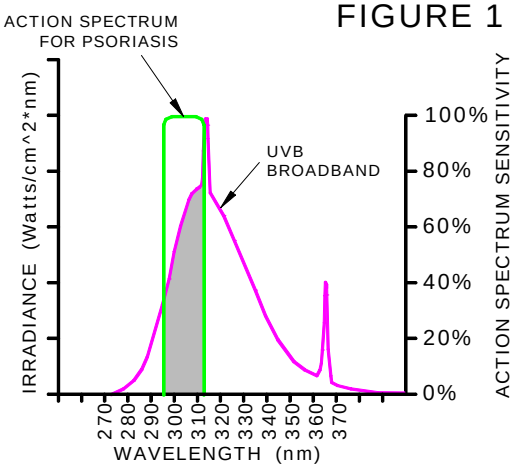


FIGURE 1

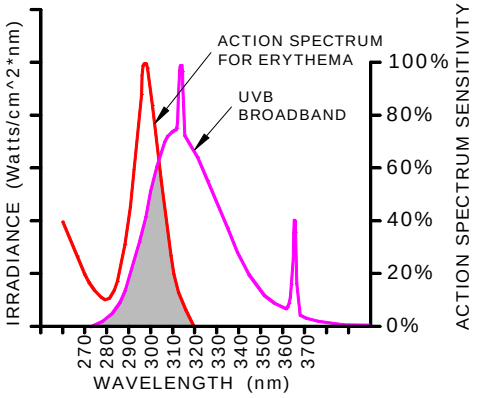


Different wavelengths of "light" produce different effects on materials. Many important processes have been scientifically studied to determine the relative contribution of each wavelength to the studied process. Graphs known as "action spectrum" are used to describe these relationships. The greater the "action spectrum sensitivity", the more responsive is the process to that wavelength.

The action spectrum for Psoriasis has been studied [1] [2] to determine that the most therapeutic wavelengths are 296 to 313 nm. Conventional UVB-Broadband lamps cover this range and have been used successfully for many years. **FIGURE 1**

The action spectrum for "sunburning" of human skin, also known as "erythema", has also been studied. Erythema is dominated by the lower wavelengths (less than 305nm) of the UVB range. Unfortunately, conventional UVB-Broadband lamps produce a large amount of "light" in this erythemogenic range. These wavelengths produce burning but have little therapeutic value. What's more, the onset of burning is normally the limiting factor in the amount of UVB that can be administered [3] and erythema is a major risk factor for skin cancer. Erythema also causes patient discomfort, which may discourage some patients from taking treatments. The grey shaded area in **FIGURE 2** gives a graphical representation of the substantial erythemogenic content of UVB-Broadband lamps.

FIGURE 2



So why not develop a light source that produces most of its output in the psoriasis action spectrum and minimizes light in the erythema action spectrum ?

Continued…

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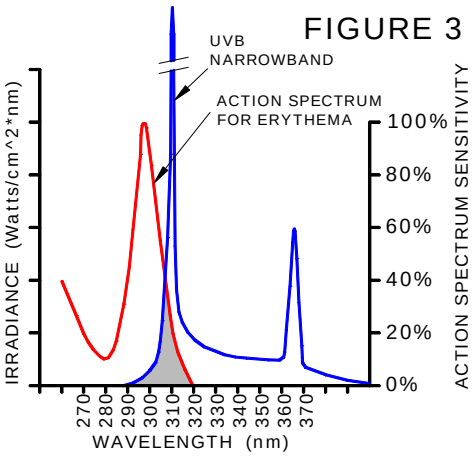

In the late 1980's, Philips Lighting of Holland developed just such a lamp, known as the "TL-01" or "UVB-Narrowband" lamp. The smaller grey shaded area in **FIGURE 3** shows that UVB-Narrowband lamps have considerably less erythemogenic output (sunburn potential) than conventional UVB-Broadband lamps. This means that more therapeutic UVB can be delivered before erythema occurs. And since erythema is a risk factor for skin cancer, these new lamps should theoretically be less carcinogenic for the same therapeutic results. [4 5 6 7] Furthermore, and critical to the success witnessed by home UVB-Narrowband phototherapy, it becomes much more possible that the disease is controlled without ever reaching the erythemogenic threshold [9 10], which was always a problem with UVB-Broadband treatments.

With the goal being to minimize the total cumulative dosage of erythemogenic ultraviolet light in a patient's lifetime, it follows that younger people should consider using UVB-Narrowband. It is interesting to note that the peak of the UVB-Narrowband curve is about ten times higher than the UVB-Broadband curve; thus the source of the name "Narrow Band".

More recent studies have confirmed these findings and also determined that UVB-Narrowband has fewer burning incidents and longer remission periods than UVB-Broadband. When compared to PUVA, UVB-Narrowband has significantly fewer side effects and has replaced it in many cases.[8] UVB-Narrowband is also capable of producing good therapeutic results without the patient ever reaching the erythemogenic threshold.[9 10]

One disadvantage of UVB-Narrowband is that, because the maximum dosage is limited by the onset of slight erythema, and UVB-Narrowband is less erythemogenic than UVB-Broadband, longer treatment times are required. This can be compensated by increasing the number of bulbs in the device.[4 5 6 7] For example, based on Solarc's home phototherapy after sales follow-ups, for UVB-Broadband the 4-bulb 1740UVB provides reasonable treatment times; whereas for UVB-Narrowband, the 8-bulb 1780UVB-NB is the preference. (For skin types I to III; which is generally white caucasions.) The theoretical ratio of erythemogenic potential of UVB-Broadband to UVB-Narrowband is in the range of 4:1 to 5:1 .

Other diseases such as vitiligo, mycosis fungoides (CTCL), and many others have also been successfully treated with UVB-Narrowband, generally for the same reasons as described above for psoriasis. UVB-Narrowband also has applications for vitamin D3 photosynthesis in human skin; a subject receiving increasing attention. As a side note, it is interesting that one of the most commonly prescribed topical creams for psoriasis: Calcipotriol (trade name: Dovonex®) is actually a vitamin D derivative and is sometimes referred to as "sunshine in a tube".

The prevailing opinion in the dermatology community is that UVB-Narrowband will largely replace UVB-Broadband as a treatment option, especially for home phototherapy. This is clearly supported by Solarc Systems' trend in home phototherapy equipment sales, with the sales of UVB-NB devices now outpacing UVB-BB sales by at least 20:1. However, UVB-Broadband will likely always have a role. Solarc's UVB-Narrowband models have an "UVB-NB" suffix in the model number, such as 1780UVB-NB. Solarc's UVB Broadband models have only a "UVB" suffix, such as 1740UVB.

Solarc Systems would like to thank the good people at Philips Lighting for developing the UVB-Narrowband product line, and helping so many of us worldwide manage our skin problems safely and efficiently.

Note: The figures used in this document are simplified representations. The UVB-Broadband curve is derived from the Solarc/SolRx 1740UVB and the UVB-Narrowband curve is derived from the Solarc/SolRx 1760UVB-NB.

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