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An appraisal of narrowband (TL-01) UVB phototherapy. British Photodermatology Group Workshop Report (April 1996)

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In Europe, ultraviolet (UV) B phototherapy is being increasingly used for the treatment of skin disease. While this is in part due to an increased awareness of the cancer risks of photochemotherapy (PUVA)[1] there is also evidence that a 'new' UVB phototherapy source (TL-01) is more effective than conventional broadband UVB sources, and is possibly as effective as PUVA. A working party of the British Photodermatology Group met to discuss whether the available evidence supports such statements. The major conclusions are presented.

Therapeutic action spectroscopy studies

The TL-01 lamp was developed as a source with an emission spectrum within the therapeutic waveband for psoriasis phototherapy.[2] Results from two therapeutic action spectroscopy studies indicate[3,4] that wavelengths of the range 295–320 nm are effective to clear psoriasis. While the design of these studies did not allow the 313 nm region to be unequivocally defined as the most effective, the knowledge that shorter wavelengths are more erythemogenic, and wavelengths longer than 320 nm are less therapeutic, supports the TL-01 source as the best option from a limited range of available fluorescent lamps.

Clinical studies—psoriasis

In 1984, TL-01 tubes were sent to several photodermatology centres in Europe. Subsequent clinical studies (Table 1)[2,5–9] have tended to report significantly greater improvement of psoriasis with TL-01 lamps when compared with broadband sources, although it should be noted that blind, randomized studies of the clearance of psoriasis with these two types of lamp have yet to be conducted. When TL-01 phototherapy and PUVA were compared, however, there was little overall difference in efficacy.[10,11] General advantages of UVB therapy (broadband and TL-01) over PUVA include safe use in children and pregnant women, no need for post-treatment eye photoprotection, no drug-induced nausea and absent drug costs.

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Other dermatoses, including atopic eczema

The TL-01 source is also effective in the management of atopic eczema;[12,13] in an open study of 21 severely affected adults, TL-01 therapy three times weekly for 12 weeks resulted in a significant reduction in dermatitis scores and potent steroid use.[12] Successful treatment of children as young as 4 years old has also been reported.[14]

The predominantly UVA-induced photosensitivity disorders, polymorphic light eruption, actinic prurigo, hydroa vacciniforme and the cutaneous porphyrias can also be treated with prophylactic TL-01 phototherapy,[15,16] and in these patients the small UVA emission of the TL-01 source reduces the risk of provocation while still producing a 'hardening' photoprotective effect. A typical course involves 10–15 treatments given in early spring.[17]

Combination therapy

TL-01 phototherapy in combination with tars, dithranol[18] or oral retinoids[19] achieves faster clearance than TL-01 therapy used alone. It should, however, be remembered that for most patients an attractive feature of monotherapy is the absence of topical therapy.

TL-01 has also been used in patients photosensitized with 8-methoxypsoralen (PUVB), which proved as effective as PUVA,[20,21] although to what degree this was due to TL-01 radiation alone requires clarification, as does the potential photocarcinogenic risk of this combination.

Table 1. TL-01 vs. broadband UVB psoriasis treatment studies 1988 to date

Reference	*n*	Comparison	Overall preference
van Weelden *et al.* 1988[2]	10	TL-01 vs. TL12	TL-01
Green *et al.* 1988[5]	52	TL-01 vs. TL-12	TL-01
Karvonen *et al.* 1989[6]	20	TL-01 vs. UV6	TL-01
Larkö 1989[7]	27	TL-01 vs. TL-12	TL-01
Storbeck *et al.* 1991[8]	23	TL-01 vs. UV6	TL-01
Picot *et al.* 1992[9]	15	TL-01 vs. TL-12	TL-01

Mechanisms of therapeutic action

In skin, TL-01 radiation is absorbed by DNA and urocanic acid[22,23] and alters antigen-presenting cell activity.[24] In psoriatic patients, TL-01 phototherapy lowers peripheral natural killer cell activity,[25] lymphoproliferation and immunoregulatory cytokine production by both Th1 (IL-2, IFNγ) and Th2 (IL-10) T-cell populations.[26] The ability of TL-01 radiation systemically to depress major components of cell-mediated immune function is thus likely to be linked to its beneficial effect in several inflammatory skin diseases.

Long-term adverse effects

As with any form of UVB exposure, in addition to the expected acute sunburn effect, chronic TL-01 exposure is likely to increase photoageing and the risk of skin cancer, although the much needed human epidemiological cancer data are unlikely to become available for many years. The next best source of information, a mouse phototumorigenesis model[2,27–29] suggests that the TL-01 source is two to three times more carcinogenic per minimal erythemal dose (MED) than broadband UVB sources (TL12, UV6). However, in clinical use, the published number of TL-01 MEDs required to clear psoriasis is usually less than one-third of that needed with broadband sources. This suggests that the long-term cancer risk of TL-01 use is no more, and possibly less, than would be expected with broadband UVB sources.[30] In addition, current evidence, albeit incomplete, points to the conclusion that the chronic narrowband UVB phototherapy-associated skin cancer risk in humans may be significantly less than that with PUVA.[31]

Table 2. Suppliers/manufacturers

Canterbury In Instruments
65 Summerfield Avenue,
Whitstable, Kent CT5 1NS, U.K.

Dixwell
Cardiac Services,
95 Finaghy Road South,
Belfast BT10 0BY,
Northern Ireland, U.K.

Waldmann
Athrodax Surgical Limited,
Great Western Court,
Ashburton, Ross-on-Wye,
Herefordshire HR9 7DW, U.K.

Philips Lighting B.V.
PO Box 80020,
5600 JM Eindhoven,
The Netherlands

TL-01 current usage

Six foot (pin to pin = 177·5 cm; end to end = 176 cm) (100 W) fluorescent TL-01 tubes have been available since 1989 and sales of this source now represent ≈ 30% of all UVB tube sales in Europe (Philips Lighting 1996, personal communication). The cost of the lamps shows considerable variation between countries and distributors, and probably the most economic approach is to obtain them directly from the manufacturer (Philips, Table 2). While a broadband UVB cabinet can be easily converted by simply replacing the tubes, longer treatment times will be necessary with the TL-01 lamps unless the number of tubes per cubicle is increased. Special TL-01 cubicles, however, are available commercially (Canterbury Instruments, Dixwell, Waldmann; Table 2), either incorporating TL-01 alone or else combined with UVA (PUVA) tubes. Combination boxes take longer to administer a treatment dose, and thus although having flexibility may represent an unsatisfactory compromise for busy phototherapy units. There is also an urgent need for Philips to develop a shorter tube suitable for the MED test and small area treatment equipment.

Metering

Although many cubicles contain in-built radiometers, the group agreed that there was considerable variability between, and even within brands, and accurate metering of TL-01 radiation can only be achieved by means of

a specifically calibrated meter. Using a meter calibrated for conventional broadband sources may also give misleading readings.

Method of use

At least two regimens are in common use. The first involves determination of the individual patient's MED by means of a separate bank of TL-01 tubes.[16] Often, 70% of the MED value is used for the first treatment, whereafter treatment is given three times or more a week with 40, 20 or 10% increments depending on local experience and skin type tolerance. Treatment is continued until clear. Another approach (Diffey 1996, personal communication) involves a standard starting dose with stepwise increases depending upon the patient's erythema response. In the photodermatoses, treatment is usually more cautious with only a 10% incremental regimen on sun-exposed sites.[16]

Conclusions

The group concluded that the available data support the view that the TL-01 lamp is more effective and probably has no greater risk than conventional UVB phototherapy in the treatment of skin disease. Recent figures indeed indicate that the lamp has an increasing share of the therapeutic UVB tube market in Europe (Philips Lighting 1996, personal communication) with early indications suggesting that it will not only replace broadband phototherapy, but may also significantly reduce PUVA use. While it was felt that this trend seems reasonable based on current knowledge, the group recognized the need to gather further evidence on all aspects of TL-01 use.

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