PHOTOTHERAPY PROTOCOLS

Dowling Day Treatment Unit
St John’s Institute of Dermatology

Written by: Dr. R. Palmer, Sister T. Garibaldinos, Prof. J. Hawk (January 2005)

Updated: Dr. R. Sarkany, Sister T. Garibaldinos (November 2006)
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Use of these guidelines

The guidelines given in this document, including starting doses and increments, are the guidelines used by staff in the Dowling Day Treatment Unit at St. John’s Institute of Dermatology. They reflect the opinions of the authors; others may prefer alternative treatment regimens. The guidelines are only suggestions for treatment and it is necessary to depart from them in some circumstances. For example, staff may modify treatment for a particular patient according to the nature of the condition (for example, the type of psoriasis), the history of previous UV treatments and the patient’s current medication. Other dermatology units who may consider using these guidelines should always ensure that the doses cited here are appropriate for their practice; calibration differs markedly between
centres. For example, TL-01 calibration in the UK varies by at least a factor of 2.7 (Lloyd 2004).

**Definition of evidence**
Where a level of evidence is cited in association with a specific statement, it refers to the best evidence underlying that statement.

Where a level of evidence is cited in association with a protocol, it refers to the best evidence underlying the use of that particular protocol in the treatment of that particular disease.

Publications are cited where they are relevant to the topic, and they do not necessarily refer to the use of a particular protocol.

**Definition of levels of evidence**
- **Ia** from meta-analysis of randomised controlled trials (RCTs)
- **Ib** from at least one RCT. Phototherapy side-to-side within-patient comparison studies are considered as RCTs.
- **IIa** from at least one well designed controlled study without randomisation
- **IIb** from at least one other type of well designed quasi-experimental study
- **III** from well-designed non-experimental descriptive studies e.g. comparative studies, correlation studies, case-control studies
- **IV** from expert committee reports or opinions and/or clinical experience of authorities
- **V** consultants or other single individuals

**Quality of recommendation of guidance**
This is graded according to the level of evidence:
- Grade A evidence: levels Ia and Ib
- Grade B evidence: levels IIa IIb and III
- Grade C evidence: level IV
Administration of psoralens

Psoralens
(Martindale 2005)
The type and quantity of food eaten before or with oral psoralen, should be kept constant. Ideally the time of day of administration should also be kept constant.

Oral 8- Methoxypsoralen (8-MOP)
8-MOP is taken 2 hours before treatment, at a dose of 25mg/m² (Ibbotson 2001). The body surface area is calculated using a nomogram. Basing the dose on body surface area is preferable to basing the dose only on body weight (McLelland 1991, Sakunthabai 1992, Sakunthabai 1994).

Oral 5-Methoxypsoralen (5-MOP)
5-MOP is taken 3 hours before treatment (Makki 1989), at a dose of 50mg/m².

Bath PUVA
(Halpern 2000)
30mls of 8-MOP 1.2% solution is added to 100 litres of water (=3.6mg/L) at 37°C (Gruss 1998) and the patient is immersed for 15 minutes (Man 2003a).
UVA exposure is given immediately. Patients do not need to shower afterwards but should have sunscreen applied to any areas that will be exposed to sunshine in the next four hours.

Hand-foot immersion PUVA
(Halpern 2000, Konya 1992)
1.3mls of 8-MOP 1.2% solution is added to 4 litres of water (=3.9mg/L) at 37°C and the patients hands or feet are immersed for 15 minutes.
UVA exposure is ideally given 30 minutes afterwards but can be given immediately. The hands/feet do not need to be washed afterwards, but should have sunscreen applied if they will be exposed to sunshine in the next four hours.

Gel PUVA
(Halpern 2000)
A thin layer of 0.005% gel is applied to the diseased area using a gloved hand.
UVA exposure is given 30 minutes later.
**PUVA; oral psoralen; psoriasis**

Although debatable, we consider it desirable to determine the initial dose by measuring the MPD (Buckley 1995, Collins 1996, Das 2003). A non-MPD based regime may be used when there is not enough unaffected skin on back, abdomen or buttocks, or the patient is skin type VI. 8-MOP is usually used in preference to 5-MOP, unless nausea or itch occur when it may be substituted by 5-MOP.

**With MPD testing (preferred); 8-MOP and 5-MOP**
Frequency of treatment; twice per week
Initial dose; 70% MPD
Increment; 20%
(Level of evidence IIa; grade B)

**Without MPD testing; 8-MOP**
(If 5-MOP is prescribed an MPD regime should be used, unless it is absolutely impossible to do so.)
Frequency of treatment; twice per week

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose</th>
<th>Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.5 J/cm²</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>1 J/cm²</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>1.5 J/cm²</td>
<td>1.5 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>2 J/cm²</td>
<td>2 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>2.5 J/cm²</td>
<td>2 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>3J/cm²</td>
<td>2.5 J/cm²</td>
</tr>
</tbody>
</table>

(Level of evidence IV)
PUVA; oral psoralen; psoriasis


Although debatable, we consider it desirable to determine the initial dose by measuring the MPD (Buckley 1995, Collins 1996, Das 2003). A non-MPD based regime may be used when there is not enough unaffected skin on back, abdomen or buttocks, or the patient is skin type VI. 8-MOP is usually used in preference to 5-MOP, unless nausea or itch occur when it may be substituted by 5-MOP.

With MPD testing (preferred); 8-MOP and 5-MOP

Frequency of treatment; twice per week
Initial dose; 70% MPD
Increment; 20%
Maximum dose for an exposure: 15J/cm²
(Level of evidence IIa; grade B)

Without MPD testing; 8-MOP

(If 5-MOP is prescribed an MPD regime should be used, unless it is absolutely impossible to do so.)

Frequency of treatment; twice per week

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose</th>
<th>Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.5 J/cm²</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>1 J/cm²</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>1.5 J/cm²</td>
<td>1.5 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>2 J/cm²</td>
<td>2 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>2.5 J/cm²</td>
<td>2 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>3 J/cm²</td>
<td>2.5 J/cm²</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 15J/cm²
(Level of evidence IV)
**PUVA; bath psoralen; psoriasis**

(Cooper 2000, Halpern 2000)

Although debatable, we consider it desirable to determine the initial dose by measuring the MPD. A non-MPD based regime may be used when there is not enough unaffected skin on back, abdomen or buttocks, or the patient is skin type VI.

**With MPD testing (preferred)**

Frequency of treatment; twice per week  
Initial dose; 50% MPD  
Increment; 20%  
Maximum dose for an exposure: 8J/cm²  
*(Level of evidence IV, grade C).*

**Without MPD testing**

Frequency of treatment; twice per week.

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose and increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.1 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>0.2 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>0.3 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>0.4 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>0.6 J/cm²</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 8J/cm²  
*(Level of evidence IV, grade C).*
**PUVA; hand-foot psoriasis and PPP**

(PPP = palmoplantar pustulosis)

When psoriasis of the hands and feet exists in association with psoriasis elsewhere, treat all areas with one of the regimes given above. When only the hands and feet are affected, they can be treated alone, with the following skin-type based regime. The evidence for effectiveness of oral PUVA is strong in hand-foot psoriasis and palmoplantar pustulosis. The evidence for effectiveness of topical PUVA is weak in hand-foot psoriasis and palmoplantar pustulosis. (Marsland 2006.)

**PUVA; oral psoralen; hand-foot psoriasis and PPP**

(Marsland 2006.)

Frequency of treatment; twice per week.

These doses are the starting doses AND increments:

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Palms and soles</th>
<th>Dorsa of hands</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1 J/cm²</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>1.5 J/cm²</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>2 J/cm²</td>
<td>1.5 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>2.5 J/cm²</td>
<td>2 J/cm²</td>
</tr>
<tr>
<td>V, VI</td>
<td>3 J/cm²</td>
<td>2.5 J/cm²</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 15J/cm²

*(Level of evidence I, grade A)*

**PUVA; hand-foot immersion psoralen; hand-foot psoriasis and PPP**

(Marsland 2006.)

Frequency of treatment; twice per week.

These doses are the starting doses AND increments:

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Palms and soles</th>
<th>Dorsa of hands</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.2 J/cm²</td>
<td>0.1 J/cm²</td>
</tr>
<tr>
<td>Level</td>
<td>Intensity</td>
<td>Dose</td>
</tr>
<tr>
<td>-------</td>
<td>-----------</td>
<td>------</td>
</tr>
<tr>
<td>II</td>
<td>0.3 J/cm²</td>
<td>0.2 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>0.4 J/cm²</td>
<td>0.3 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>0.5 J/cm²</td>
<td>0.4 J/cm²</td>
</tr>
<tr>
<td>V, VI</td>
<td>0.6 J/cm²</td>
<td>0.5 J/cm²</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 8J/cm²
(Level of evidence V, grade C)
**PUVA; oral psoralen; vitiligo**

(British Photodermatology Group 1994, Kwok 2002)

Frequency of treatment; twice per week
Initial dose; 0.5 J/cm²
Incremental doses; 0.25 J/cm² increase at each visit until a maximum of 5 J/cm² is reached. If erythema develops, omit treatment until settled and reduce to the previous dose, and then use increments of 0.1-0.25 J/cm² if no erythema.
*(Level of evidence IV, grade C)*

**PUVA; bath psoralen; vitiligo**

Frequency of treatment; twice per week
Initial dose; 0.05 face, 0.1 J/cm² other sites
Incremental doses: 0.05 J/cm² each treatment until a maximum of 1 J/cm² is reached. If erythema develops, omit treatment until settled, reduce to previous dose, and then use increments of 0.02-0.05 J/cm² if no erythema.
Maximum dose for an exposure: 1J/cm²
*(Level of evidence V)*

**PUVA; gel psoralen; vitiligo**

Frequency of treatment; twice per week
Initial dose: 0.05 J/cm² to face*, 0.1 J/cm² to body
Incremental doses: 0.05 J/cm² each treatment until a maximum of 1 J/cm² is reached. If erythema develops, omit treatment until settled, reduce to previous dose, and then use increments of 0.02-0.05 J/cm² if no erythema.
Maximum dose for an exposure: 1J/cm²
*If marked erythema develops following the first dose, omit treatment until settled and restart using 1:4 diluted solution with the above doses.
*(Level of evidence V)*
PUVA; oral psoralen; mycosis fungoides


Protocol 1

Frequency of treatment; twice per week

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose and increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.25 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>1 J/cm²</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 15J/cm²

(Level of evidence IV, grade C)

Protocol 2

Frequency of treatment; twice per week
Initial dose; 70% MPD
Increment; 20%
Maximum dose for an exposure: 15J/cm²

(Level of evidence V)

Notes

- Hypopigmented disease, treat as type I.
- For scalp lesions covered by hair, it is likely to be necessary to trim hair as close to the scalp as possible to allow for easier exposure under the Waldmann 800 canopy.
- For disease affecting the eyelids, expose during treatment for minimum period to achieve clearance. Start with 0.25 J/cm² and increase by 0.25 J/cm² or less until clear, then add goggles full time, but continue to monitor for relapse.
- If patient has disease on genitals, undertake treatment as for eyelid protocol.
- A few patients may react adversely to PUVA with pain or erythema or both; in these patients increments of UVA dose should be small.
**PUVA; bath psoralen; mycosis fungoides**

(British Photodermatology Group 1994)

Frequency of treatment; twice per week

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose and increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.05 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>0.1 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>0.15 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>0.15 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>0.2 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>0.2 J/cm²</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 8J/cm²

*(Level of evidence V)*

**With MPD testing**

Frequency of treatment; twice per week
Initial dose; 40% MPD
Increment; 20%
Maximum dose for an exposure: 8J/cm²

*(Level of evidence IV, grade C).*
**PUVA; oral psoralen; atopic eczema**


Frequency of treatment; twice per week

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose and increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>1.5 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>1.5 J/cm² in children, 2 J/cm² in adults</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 15J/cm²  
*Level of evidence IIa, Grade B*

If eczematous skin flares, which is common early in treatment, continue with treatment but consider a slowly reducing course of oral prednisolone. It is important that PUVA is continued with normal increments if the uninvolved skin is tolerating the treatments, as the optimum dose under such circumstances has not yet been reached to suppress the eczema.

Continue twice weekly treatments until the patient is clear of eczema, giving extra exposures if necessary to areas of skin spared during treatments, such as neck, under chin, flexures and antecubital fossae.

The dose at which clearance is achieved will be between 5 and 15 J/cm² depending on skin type. Once clear, continue to give this dose at each treatment session, but gradually reduce the frequency of treatments, as follows:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twice per week</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Three times every 2 weeks</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Once per week</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Once per fortnight</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Once every 3 weeks</td>
<td>6 weeks</td>
</tr>
<tr>
<td>STOP</td>
<td></td>
</tr>
</tbody>
</table>
If any tendency to relapse occurs following reductions, return to previous frequency for a further six weeks. If loss of control occurs, refer for further medical assessment.

Also:
- Encourage the use of adequate emollient therapy.
- Observe for signs of bacterial or viral skin infection, which will require early medical assessment.
- Once the exposure dose is above 7J/cm², cover the patient’s face for half the exposure time.
- Stand children on a raised platform during exposure to give a more even exposure to the whole body.

**PUVA; bath psoralen; atopic eczema**

Frequency of treatment; twice per week

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose and increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.1 J/cm²</td>
</tr>
<tr>
<td>II</td>
<td>0.2 J/cm²</td>
</tr>
<tr>
<td>III</td>
<td>0.2 J/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>0.2 J/cm²</td>
</tr>
<tr>
<td>V</td>
<td>0.3 J/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>0.3 J/cm² in children, 0.4 J/cm² in adults</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 8J/cm²

*(Level of evidence V)*
**PUVA; oral psoralen; polymorphic light eruption**


This protocol can also be used for actinic prurigo patients being treated prophylactically in spring who do not currently have lesions of prurigo.

In patients with a history of severe PLE, the dermatologist may suggest a greater number of treatments; in that case, give treatment as below, then continue treatment with 20% increments until the correct number of treatments has been given.

It may be appropriate to only treat sites which will be exposed to sunshine and which are prone to developing PLE.

If PLE flares, withhold therapy until settled. The patient may often need prednisolone 30mg each morning for several days until settled and then just on each treatment day.

**Skin type III - VI**

Twice weekly for 4 weeks. 40% increments.

<table>
<thead>
<tr>
<th>Week</th>
<th>Skin type III-VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td></td>
<td>0.7 J/cm²</td>
</tr>
<tr>
<td>2</td>
<td>1 J/cm²</td>
</tr>
<tr>
<td></td>
<td>1.4 J/cm²</td>
</tr>
<tr>
<td>3</td>
<td>2 J/cm²</td>
</tr>
<tr>
<td></td>
<td>2.8 J/cm²</td>
</tr>
<tr>
<td>4</td>
<td>3.9 J/cm²</td>
</tr>
<tr>
<td></td>
<td>5.6 J/cm²</td>
</tr>
</tbody>
</table>

**Skin type I – II (or if there is a history of difficulties with the above protocol)**

Twice weekly for six weeks.

<table>
<thead>
<tr>
<th>Week</th>
<th>Skin type I-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.3 J/cm²</td>
</tr>
<tr>
<td></td>
<td>0.5 J/cm²</td>
</tr>
<tr>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
</tr>
<tr>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>1.9</td>
</tr>
</tbody>
</table>
Level of evidence V
**PUVA; bath psoralen; polymorphic light eruption**

This protocol can also be used for actinic prurigo patients being treated prophylactically in spring who do not currently have lesions of prurigo.

In patients with a history of severe PLE, the dermatologist may suggest a greater number of treatments; in that case, give treatment as below, then continue treatment with 20% increments until the correct number of treatments has been given.

It may be appropriate to only treat sites which will be exposed to sunshine and which are prone to developing PLE.

If PLE flares, withhold therapy until settled. The patient may often need prednisolone 30mg each morning for several days until settled and then just on each treatment day.

Twice weekly for four weeks. 40% increments.

<table>
<thead>
<tr>
<th>Week 1</th>
<th>0.06 J/cm²</th>
<th>0.09 J cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.12</td>
<td>0.17</td>
</tr>
<tr>
<td>3</td>
<td>0.25</td>
<td>0.35</td>
</tr>
<tr>
<td>4</td>
<td>0.49</td>
<td>0.68</td>
</tr>
</tbody>
</table>

*Level of evidence V*
PUVA; oral psoralen; actinic prurigo

This protocol is for treating patients who currently have lesions of prurigo. If instead the only aim of treatment is the prevention of new lesions, use a PLE protocol.

Twice weekly for 6 weeks.

<table>
<thead>
<tr>
<th>Week</th>
<th>Start Dose</th>
<th>Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.25 J/cm²</td>
<td>0.4 J/cm²</td>
</tr>
<tr>
<td>2</td>
<td>0.55 J/cm²</td>
<td>0.75 J/cm²</td>
</tr>
<tr>
<td>3</td>
<td>1.0 J/cm²</td>
<td>1.3 J/cm²</td>
</tr>
<tr>
<td>4</td>
<td>1.6 J/cm²</td>
<td>1.9 J/cm²</td>
</tr>
<tr>
<td>5</td>
<td>2.4 J/cm²</td>
<td>2.9 J/cm²</td>
</tr>
<tr>
<td>6</td>
<td>3.4 J/cm²</td>
<td>4.0 J/cm²</td>
</tr>
</tbody>
</table>

If not clear of lesions at the end of this period, continue twice weekly at 4.0 J/cm² until clear of lesions, for a maximum of a further 6 weeks.

Level of evidence V

PUVA; oral psoralen; erythropoietic protoporphyria

(Roelandts 1995, Ros 1988)

Start dose: 1J/cm²
Increment: 20% up to dose of 15.4J/cm² (i.e. the first 15 treatments), and then no increment at all for the final 10 treatments (i.e. 15.4J/cm² at each treatment)
Frequency: twice weekly
Total number of treatments: 25
Maximum dose for an exposure: 15J/cm²

Level of evidence IV.
**TL-01; psoriasis**


Frequency of treatment; three times per week (Mon, Wed, Fri) or twice per week. Three times per week achieves clearance significantly faster, and possibly with fewer exposures, than twice per week (Cameron 2002), but if patients find it inconvenient to attend three times per week, they should be offered twice-weekly treatment. Treatment five times per week is not recommended (Dawe 1998).

Although debatable, we consider it desirable to determine the initial dose by measuring the MED (Drummond 2003, Gordon 1998). A non-MED based regime may be used when there is not enough unaffected skin on back, abdomen or buttocks, or the patient is skin type VI.

**With MED testing (preferred)**

Initial dose; 70% of MED  
Increments; 20%  
Maximum dose for an exposure: 5J/cm²  
(*Level of evidence Ib; grade A*)

**Without MED testing**

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose</th>
<th>First 3 increments</th>
<th>Subsequent increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>100 mJ/cm²</td>
<td>40 mJ/cm²</td>
<td>20% of previous dose</td>
</tr>
<tr>
<td>II</td>
<td>120 mJ/cm²</td>
<td>50 mJ/cm²</td>
<td>20% of previous dose</td>
</tr>
<tr>
<td>III</td>
<td>150 mJ/cm²</td>
<td>60 mJ/cm²</td>
<td>20% of previous dose</td>
</tr>
<tr>
<td>IV</td>
<td>200 mJ/cm²</td>
<td>80 mJ/cm²</td>
<td>20% of previous dose</td>
</tr>
<tr>
<td>V</td>
<td>300 mJ/cm²</td>
<td>120 mJ/cm²</td>
<td>20% of previous dose</td>
</tr>
<tr>
<td>VI</td>
<td>500 mJ/cm²</td>
<td>200 mJ/cm²</td>
<td>20% of previous dose</td>
</tr>
</tbody>
</table>

Maximum dose for an exposure: 5J/cm²  
(*Level of evidence V*)
**TL-01; vitiligo**


Frequency of treatment; twice per week  
Initial dose; 100 mJ/cm²  
Increments; 20%  
Maximum dose for an exposure: 2J/cm²  
*Level of evidence Ia; grade A*

**TL-01; mycosis fungoides**

(Baron 2003, Clark 2000, Diederen 2003, Ramsay 1992)

Frequency of treatment; twice per week  
Initial dose; 70% of MED  
Increments; 20%  
Maximum dose for an exposure: 5J/cm²  
*Level of evidence IIa; grade B*

**TL-01; atopic eczema**

(Collins 1995a, George 1993, Hudson-Peacock 1996)

Frequency of treatment; twice per week  
Initial dose; 70% of MED  
Increments; 20%  
Maximum dose for an exposure: 5J/cm²  

The dose being given when clearance is achieved is the “clearance dose”.  
Once clearance is achieved wean down treatment as follows:

<table>
<thead>
<tr>
<th>Dose as percentage of clearance dose</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>Twice per week</td>
<td>4 weeks</td>
</tr>
<tr>
<td>100%</td>
<td>Once per week</td>
<td>4 weeks</td>
</tr>
<tr>
<td>75%</td>
<td>Once per fortnight</td>
<td>4 weeks</td>
</tr>
<tr>
<td>60%</td>
<td>Once per 3 weeks</td>
<td>6 weeks</td>
</tr>
<tr>
<td>STOP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(Level of evidence V).
**TL-01; polymorphic light eruption**

(Bilsland 1993, Man 1999)

This protocol can also be used for actinic prurigo patients being treated as prophylaxis in spring who do not currently have lesions of prurigo.

In patients with a history of severe PLE, the dermatologist may suggest a greater number of treatments; in that case, give treatment as below, then continue treatment with 20% increments until the correct number of treatments has been given.

It may be appropriate to only treat sites which will be exposed to sunshine and which are prone to developing PLE.

If PLE flares, withhold therapy until settled. The patient may need prednisolone 30mg each morning for several days until settled and then just on each treatment day.

**Skin type I-IV (20% increments)**

<table>
<thead>
<tr>
<th>Week</th>
<th>Skin type I-IV (20% increments)</th>
<th>180 mJ/cm²</th>
<th>260 mJ/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150 mJ/cm²</td>
<td>220 mJ/cm²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>220 mJ/cm²</td>
<td>260 mJ/cm²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>310 mJ/cm²</td>
<td>370 mJ/cm²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>440 mJ/cm²</td>
<td>530 mJ/cm²</td>
<td></td>
</tr>
</tbody>
</table>

**Skin types V – VI (40% then 20% increments)**

<table>
<thead>
<tr>
<th>Week</th>
<th>Skin types V – VI (40% then 20% increments)</th>
<th>800 mJ/cm²</th>
<th>1,150 mJ/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150 mJ/cm²</td>
<td>200 mJ/cm²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>300 mJ/cm²</td>
<td>400 mJ/cm²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>600 mJ/cm²</td>
<td>800 mJ/cm²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>960 mJ/cm²</td>
<td>1,150 mJ/cm²</td>
<td></td>
</tr>
</tbody>
</table>

*(Level of evidence V).*
**TL-01; actinic prurigo**

This protocol is for treating patients who currently have lesions of prurigo. If instead the only aim of treatment is the prevention of new lesions, use a PLE protocol.

Twice weekly for 6 weeks.

<table>
<thead>
<tr>
<th>Week</th>
<th>Dosage 1</th>
<th>Dosage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 mJ/cm²</td>
<td>40 mJ/cm²</td>
</tr>
<tr>
<td>2</td>
<td>60 mJ/cm²</td>
<td>90 mJ/cm²</td>
</tr>
<tr>
<td>3</td>
<td>100 mJ/cm²</td>
<td>130 mJ/cm²</td>
</tr>
<tr>
<td>4</td>
<td>160 mJ/cm²</td>
<td>190 mJ/cm²</td>
</tr>
<tr>
<td>5</td>
<td>240 mJ/cm²</td>
<td>290 mJ/cm²</td>
</tr>
<tr>
<td>6</td>
<td>340 mJ/cm²</td>
<td>400 mJ/cm²</td>
</tr>
</tbody>
</table>

If not clear of lesions at the end of this period, continue twice weekly at 400 mJ/cm² until clear of lesions, for a maximum of a further 6 weeks.

*(Level of evidence V).*

**TL-01; erythropoietic protoporphyria (desensitisation protocol)**

*(Collins 1995b, Warren 1998)*

Start dose: 70% of MED  
Increment : 20%  
Frequency: twice weekly  
Total number of treatments: 18  
Maximum dose for an exposure: 5J/cm²

*(Level of evidence IV).*
**UV6; psoriasis**

Treatment may be given three times per week or, if the patient is an inpatient, five times per week.

**With MED testing**

Initial dose; 70% of MED.
3 x weekly: 20% increments.
5 x weekly: 10% increments.
Maximum dose for an exposure: 2J/cm²

*(Level of evidence V).*

**Without MED testing**

Note that the doses cited here are for broad-band UVB with UV6 lamps; broad-band UVB with UV21 lamps will require significantly lower doses.

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Starting dose</th>
<th>Increment (3x weekly)</th>
<th>Increment (5x weekly)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>50 mJ/cm²</td>
<td>40 mJ/cm²</td>
<td>20 mJ/cm²</td>
</tr>
<tr>
<td>II</td>
<td>60 mJ/cm²</td>
<td>50 mJ/cm²</td>
<td>20 mJ/cm²</td>
</tr>
<tr>
<td>III</td>
<td>70 mJ/cm²</td>
<td>60 mJ/cm²</td>
<td>30 mJ/cm²</td>
</tr>
<tr>
<td>IV</td>
<td>100 mJ/cm²</td>
<td>80 mJ/cm²</td>
<td>40 mJ/cm²</td>
</tr>
<tr>
<td>V</td>
<td>150 mJ/cm²</td>
<td>120 mJ/cm²</td>
<td>60 mJ/cm²</td>
</tr>
<tr>
<td>VI</td>
<td>250 mJ/cm²</td>
<td>200 mJ/cm²</td>
<td>100 mJ/cm²</td>
</tr>
</tbody>
</table>

*Ensure 24 hrs between treatments.*

Maximum dose for an exposure: 2J/cm²

*(Level of evidence V).*
Notes on PUVA, TL-01 and UV6 therapy

1. Maximising the efficacy of phototherapy

Concomitant topical therapies

Patients with a dry scaly condition should be encouraged to use an appropriate emollient regularly, particularly prior to UV treatments. A water-based emollient, such as aqueous cream or Diprobase, should be applied 30mins to one hour before treatment (usually to all UV exposed areas as they tend to develop dry skin at all treated sites). Also, any patient who develops itch during phototherapy may benefit from emollients. Regular use of bath oils will help counteract the drying tendency of UV.

Salicylic acid may be used before a course of phototherapy starts, in order to remove scale. In the treatment of psoriasis, caution should be exercised with the concomitant use of potent topical steroid, as it may lead to earlier relapse (Morison 1978b).

Posture in the cabinet

If patients have disease in areas that would not normally be exposed to UV (eg. axillae) they should be given appropriate advice concerning posture during the irradiation.

2. Protection of the face, eyes, genitals, and feet during treatment

Exposure to the face should be avoided if it is uninvolved; if it is involved, cover the face full time once clearance is achieved.

UV opaque goggles should be worn during treatment unless the patient has involvement of the eyelids, in which case they must close their eyes during treatment.

In males, genital protection should be standard practice for patients having UV treatments (unless medical staff request that the genital area is treated).

If the feet are uninvolved, they should be protected with socks.
3. Phototherapy in children

Time off school
A treatment course for atopic eczema may take up to 12 months necessitating time away from school for regular treatments and medical reviews. The parents will need to inform the school and explain the necessary precautions.

Managing patient anxieties
The phototherapy machines can be quite frightening, even for an adult, therefore it’s very important that time is spent explaining to the child how the machine works and how it can help their skin. Allow the child to stand in the machine with the door open, allow them to try on a pair of goggles and explain what will happen on their first visit. Offering encouragement and providing a positive, pleasant environment for the child can help towards successful treatment. It also helps to try and keep the child entertained during the treatments and avoid overheating. Give the treatment in 2 doses, allowing the child to cool down and have a cold drink. Encourage the parent to bring in books to read to the child or use a personal stereo to help pass the time.

4. Psoriasis and mycosis fungoides; additional treatment of special sites

Lower legs
If the lower legs appear slow to respond after 6 exposures, give them an additional 20% of the whole body dose, with the feet covered and the patient standing on a platform.

Trunk
Once the trunk is clear instruct the patient to wear a T-shirt in the machine and continue with normal increments.

Palms
If the palms are affected, they may require a higher dose of UV (eg. 20-50% higher) than the rest of the body to clear. This higher dose may be given from the first treatment, or starting after approximately 6 exposures if they appear slow to respond.

Soles
If these are involved, treat them (separately), as for the rest of the body.

Knees and elbows (psoriasis)
If other sites are improving but the elbows/knees are not, then consider using Diprosallic under Granuflex applied after each treatment session.
5. **The treatment of vitiligo**

All patients should be photographed prior to treatment commencement. Patients should be reviewed in clinic at 4-6 weeks, and then after 3 months; if they are not improving at 3 months treatment may be discontinued.

6. **The treatment of mycosis fungoides**

Careful assessment of shielded areas is needed – give additional treatments as necessary.

PUVA and radiotherapy treatments can be given on the same day. For lesions that have ulcerated and are usually sore for several weeks after radiotherapy, leave dressing intact during PUVA until soreness has settled. Nursing staff should regularly monitor lesions that are not responding to PUVA or are showing a tendency to ulceration. If there is doubt, ask for review by the medical team.

7. **Finishing a course of phototherapy**

If a patient is clear of disease, phototherapy should be stopped (except in the case of atopic eczema).

The definition of “clear” for psoriasis is that the sites of previous lesions are not palpable; a minor degree of erythema may be acceptable. In psoriasis, if a patient has had minimal residual activity for four treatments, phototherapy should be stopped.

If a patient is failing to improve they should be booked into the next available phototherapy clinic.

The maximum number of treatments per course, except for vitiligo and atopic eczema patients, is 30 unless medical advice is given to the contrary.
Notes on PUVA therapy

1. The use of oral 5-MOP
When treatment with 5-MOP is commenced (either ab initio or changing during a course of PUVA from 8-MOP to 5-MOP) the MPD must be assessed.
Ideally 5-MOP should not be used in patients with skin type V-VI.

2. Potential drug interactions
Warfarin and phenytoin have significant drug interactions with oral psoralens (Martindale 2005), and therefore patients taking these drugs should not have oral PUVA, but can have bath PUVA.

3. Re-PUVA (Retinoid + PUVA)
In the treatment of psoriasis, retinoids reduce the cumulative dose and number of exposures required for clearance.

When a retinoid is prescribed before a course of PUVA, allow 14 days after the patient starts taking the medication before booking the patient for a MPD test and commencing PUVA.

When added during a course of PUVA, continue with the same dose of UVA until day 14 and repeat the MPD; if a MPD test is impossible due to lack of uninvolved skin, then continue with the same dose of UVA for an additional 7 days (total 21 days) then continue with cautious increments. The dose and starting date of the retinoid should be clearly recorded on the treatment sheet in red or green pen.

Dose increments may need to be reduced if the patient develops significant desquamation.

4. Sun avoidance
For 24 hours after PUVA therapy, particularly oral PUVA treatment, patients should take precautions when outside (i.e. long sleeves and trousers, hat and sunscreen). Patients should avoid sitting next to a window, particularly on sunny days.

5. Guidelines for eye protection for oral PUVA
Recommended duration of eye protection after a PUVA session

Adults; 12 hours
Adults with existing cataracts; 24 hours
Children; 24 hours
Bath PUVA; if the patient has atopic eczema, is a child, or has widespread disease (>30% surface area) eye protection should be used for 12 hours; in other cases no protection is required.

**Method of eye protection**

What follows is taken, with permission, from guidance by Professor B.L. Diffey (Regional Medical Physics Department, Newcastle General Hospital, NE4 6BE) available on the world-wide-web; [http://www.bad.org.uk/doctors/guidelines/puva.asp](http://www.bad.org.uk/doctors/guidelines/puva.asp).

**Sunglasses**

All sunglasses sold in “Boots” retail shops conform with British Standard BS2724. However, this standard is not stringent enough to meet the protection of psoralen sensitised eyes. Patients should be advised to look for those sunglasses which are marked UV400. The lenses in these sunglasses block all wavelengths below 400 nm (i.e. UVA and UVB) and should be the only type recommended to PUVA patients which can be purchased in “Boots”. There are alternative makes available and details of these can be found in these references: Moseley 1988 and British Association of Dermatologists; Protective Eyewear for Photochemotherapy.

**Prescription Lenses**

Patients who normally wear prescription spectacles and wish to continue wearing these can have them coated with a material which is visibly clear but opaque to both UVA and UVB (Moseley 1990, Moseley 1992). Only plastic lenses can be coated but these comprise 96% of new prescription spectacles in the UK. Patients should be advised to ask opticians for a UV Coating. Because of increasing awareness of the association between sun exposure and the induction of cataract, most opticians are now well aware of the need to offer protection against ultraviolet radiation and can arrange for lenses to be coated at a cost of approximately £10 per pair.

**Clear Safety Spectacles**

A low cost safety spectacle in clear polycarbonate which is completely opaque to all ultraviolet wavelengths (i.e. blocks UVA and UVB) and which can be recommended at £3:00 per pair (inc. VAT) is the Bolle Coverspec (product code 93BS71) obtainable from St. Helier Safety, St Helier House, Green Lane, Pelaw, Gateshead NE10 0UW (Tel: 0191 469 8421). A more robust safety spectacle (type UVC 303) costing £12:34 per pair (inc. VAT) is obtainable from Ultraviolet Products Limited, Science Park, Milton Road, Cambridge CB4 4FH (Tel: 01223 420022). The ultraviolet absorbing properties of the two spectacles are very similar, and both come with sideshields.
**Determining the suitability of spectacles**

Measure the amount of UVA radiation transmitted through the lens with the lamps used for PUVA therapy and a handheld UVA meter (British Photodermatology Group 1994, Diffey 1980). If the meter reads between 10 and 20 mW/cm² without the lens in place, the reading needs to fall to at least 0.2 mW/cm² and preferably below 0.1 mW/cm² in order for the spectacles to provide adequate protection (Mountford 1990)

**Eye protection in children**

In children, an ophthalmology assessment should be done either before treatment starts or soon after treatment begins. Children are entitled to a NHS voucher to help cover the cost of glasses, which need to be worn for 24 hours following psoralen ingestion. It is important that the child understands the reason for eye protection and is happy with the glasses, in order to ensure that they are worn constantly during daylight hours, especially at school.

**Maximum dose guidelines**

These are the suggested maximum doses for each exposure.

**PUVA**

<table>
<thead>
<tr>
<th></th>
<th>J/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral psoralen</td>
<td>15 *</td>
</tr>
<tr>
<td>Bath psoralen</td>
<td>8</td>
</tr>
<tr>
<td>Oral psoralen for vitiligo</td>
<td>5</td>
</tr>
<tr>
<td>Bath psoralen for vitiligo</td>
<td>1</td>
</tr>
<tr>
<td>Gel psoralen for vitiligo</td>
<td>1</td>
</tr>
<tr>
<td>Hand-foot immersion psoralen</td>
<td>8</td>
</tr>
</tbody>
</table>

**NBUVB**

<table>
<thead>
<tr>
<th></th>
<th>J/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>For indications other than vitiligo</td>
<td>5</td>
</tr>
<tr>
<td>Vitiligo</td>
<td>2</td>
</tr>
</tbody>
</table>

**UV6**

Maximum dose is 2 J/cm²

*Level of evidence V, except * which is level of evidence IV, grade C; British Photodermatology Group 1994*
### Management of phototherapy-induced erythema

Examine the patient and ask them for a history of erythema, soreness or itching since their last treatment session.

<table>
<thead>
<tr>
<th>E1</th>
<th>Just perceptible erythema</th>
<th>Repeat previous dose. Subsequently, reduce increment (eg. instead of 20% increment use 10% increment)</th>
</tr>
</thead>
</table>
| E2    | Well defined marked erythema which is asymptomatic or causing minimal discomfort | If the E2 is localised (eg. face), cover this area full-time until settled, and then continue to shield part-time during further treatments.  
If the E2 is generalised, omit treatment until settled, then repeat previous dose and reduce subsequent increments (eg. instead of 20% increment use 10% increment) |
| E3    | Fiery sore erythema with oedema | No treatment until erythema has settled and patient been reviewed by doctor. Topical steroids, emollients and analgesia may help |
| E4    | Severe fiery erythema with oedema and/or blistering | No treatment. Review by doctor for treatment and plans for alternative treatment when erythema has subsided |

### Missed treatment guidelines

It should be ascertained that a treatment was not missed due to erythema; if it was, the erythema guidelines should be followed.

<table>
<thead>
<tr>
<th>Number of days since last treatment:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=7</td>
<td>Continue as if no treatments missed</td>
</tr>
<tr>
<td>8-10</td>
<td>Repeat last dose</td>
</tr>
<tr>
<td>11-15</td>
<td>Reduce dose by 20%, or if this is below the starting dose, give the starting dose</td>
</tr>
<tr>
<td>16-20</td>
<td>Reduce dose by 35%, or if this is below the starting dose, give the starting dose</td>
</tr>
<tr>
<td>21+</td>
<td>Give a dose between the starting dose and 50% of the previous dose, depending on skin-type, treatment modality, etc.</td>
</tr>
</tbody>
</table>
**Discharge Guidelines**

If a patient is clear of disease, phototherapy should be stopped (except in the case of atopic eczema).

The definition of “clear” for psoriasis is that the sites of previous lesions are not palpable; a minor degree of erythema may be acceptable. In psoriasis, if a patient has had minimal residual activity for four treatments, phototherapy should be stopped.

If a patient is failing to improve they should be booked into the next available phototherapy clinic.

The maximum number of treatments per course, except for vitiligo and atopic eczema patients, is 30 unless medical advice is given to the contrary.
References


