Grenz rays have also been proved to be safe when certain therapy recommendations are followed (5).

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311 nm UVB Lamps in the Treatment of Psoriasis with the Ingram Regimen

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A new experimental fluorescent lamp emitting UVB mainly in a narrow peak around 311 nm was compared with a conventional broad band UVB lamp in the treatment of psoriasis with the Ingram regimen. In 20 patients one arm was treated with the new lamps and the other arm with conventional lamps. In 12 patients the results were same, but the new lamp was more effective in 8 patients. In another trial, 53% of 17 patients treated with the new lamp showed good results compared with 30% of 23 patients treated with conventional lamps. In conclusion, the 311 nm UVB lamp is at least as effective as the conventional broad band UVB lamps in the treatment of psoriasis with the Ingram regimen. (Accepted August 10, 1988.)

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UVB-phototherapy is common in the treatment of psoriasis either alone or in combination with topical preparations. In addition to therapeutically effective UVB of wavelength about 310 nm (1, 2), conventional broad band UVB lamps also emit a considerable amount of irradiation in the wavelength range below 300 nm, which may cause an increased risk of skin cancers and other side effects. A lamp emitting only therapeutic UVB but not short wave UVB might be an ideal lamp for treatment of psoriasis. We compared traditional UVB-lamps (Fig. 1) with a new experimental fluorescent lamp (Philips TL 01) having a narrow spectral peak at 311 nm (Fig. 2) for the treatment of psoriasis with the Ingram regimen.

MATERIAL AND METHODS

Lamps

The new experimental fluorescent lamps (Philips TL 01) have an emission spectrum dominated by a narrow peak at 311 nm (3). Twenty-two Philips TL 01 lamps were installed in an ordinary PUVA cabin

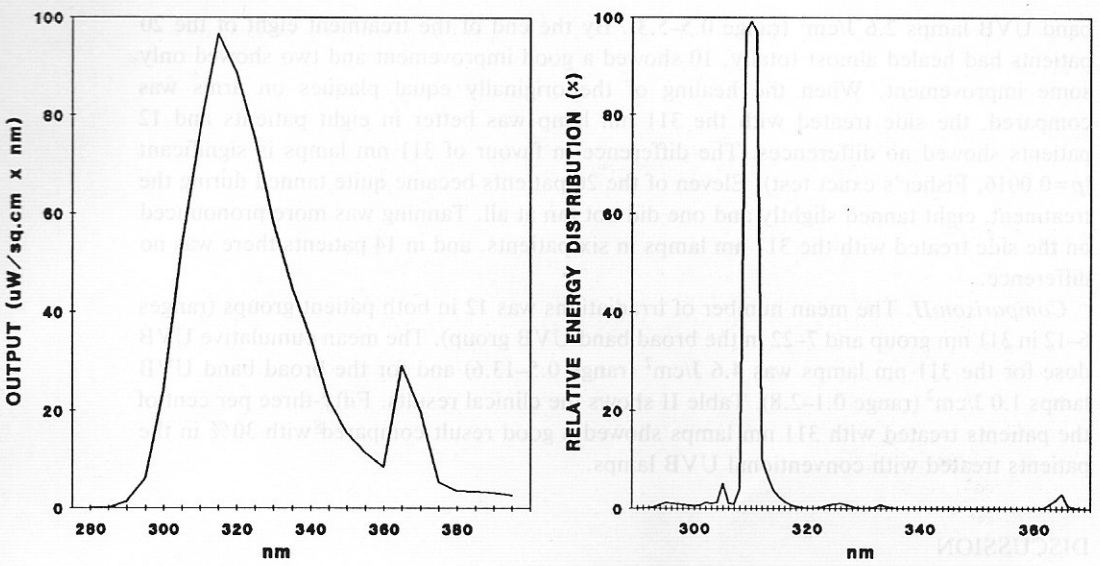

Fig. 1. Spectral energy distribution of Sylvania ultraviolet F75/85W/UV6 lamps.

Fig. 2. Relative spectral energy distribution of Philips TL 01 lamps.

(Airam PUVA 22) and they provided at the distance of 35 cm an irradiance of 4.04 mW/cm^2 in the UVB range. The lamps were compared with 40 conventional broad band UVB lamps (Sylvania Ultraviolet F75/85W/UV6) installed in a Waldmann 6002 cabin providing an irradiance of 1.29 mW/cm^2 in the UVB range. The irradiance of both lamps was measured with a spectroradiometer EG & G 580/585 calibrated with standard lamp Optronix M-356. With this equipment the minimal erythema dose (MED) (tested on six voluntary healthy individuals) was 0.97 J/cm^2 for Philips 311 nm lamps and 0.23 J/cm^2 for Sylvania lamps. Thus a 4.2 times higher UVB dose was needed for the Philips 311 nm lamps to give an equierythemogenic treatment schedule for both lamps.

Patients

All 60 patients (20 in comparison I and 40 in comparison II) had widespread plaque-type psoriasis and were treated as in-patients at the Department of Dermatology, University of Oulu.

Treatment schedule

Comparison I. Twenty patients were treated with Ingram's regimen. Patients with symmetrical plaques of equal severity on both arms were selected. Anthralin in either Lassar's paste or cream base (Amitase®, Schering Corporation, USA) was applied daily on all psoriatic plaques and kept on the skin for 12 hours. UVB treatment was given daily, with Philips 311 nm lamps on the right arm and with Sylvania UVB lamps on the left arm. The rest of the body was treated with either of the lamps. While an arm was irradiated, the rest of the body was carefully covered with green cloths and, vice versa. The irradiation scheme is shown in Table I. To give equierythemogenic treatment, 4–5 times higher UVB doses were needed for 311 nm lamps. If erythema occurred during the treatment, the next UVB-doses were increased more slowly, or not increased at all. Psoriatic plaques on the arms were compared for possible differences in healing.

Comparison II. Forty consecutive in-patients were treated daily with either Philips 311 nm lamps (17 patients with odd birthdays), or Sylvania UVB lamps (23 patients with even birthdays). The irradiation scheme was the same as in comparison I (Table I). Anthralin was applied in cream base (Amitase®) to the psoriatic plaques for 12 hours daily, in the concentration of 0.25% during the first week and 0.5% thereafter.

RESULTS

Comparison I. The mean number of irradiations was 19 (range 9–29) and the mean cumulative UVB-dose for 311 nm lamps was 11.4 J/cm^2 (range 2.6–22.1) and for the broad

band UVB lamps 2.6 J/cm^2 (range 0.5–5.3). By the end of the treatment eight of the 20 patients had healed almost totally, 10 showed a good improvement and two showed only some improvement. When the healing of the originally equal plaques on arms was compared, the side treated with the 311 nm lamp was better in eight patients and 12 patients showed no differences. The difference in favour of 311 nm lamps is significant (p=0.0016, Fisher's exact test). Eleven of the 20 patients became quite tanned during the treatment, eight tanned slightly and one did not tan at all. Tanning was more pronounced on the side treated with the 311 nm lamps in six patients, and in 14 patients there was no difference.

Comparison II. The mean number of irradiations was 12 in both patient groups (ranges 6–12 in 311 nm group and 7–22 in the broad band UVB group). The mean cumulative UVB dose for the 311 nm lamps was 4.6 J/cm^2 (range 0.5–13.6) and for the broad band UVB lamps 1.0 J/cm^2 (range 0.1–2.8). Table II shows the clinical results. Fifty-three per cent of the patients treated with 311 nm lamps showed a good result compared with 30% in the patients treated with conventional UVB lamps.

DISCUSSION

The new 311 nm UVB lamp (Philips TL 01) is still at the experimental stage and has not been widely used. In two reports (4, 5) it was shown to be more effective than the conventional broad spectrum UVB lamp in the treatment of psoriasis. In this report we show that the 311 nm lamp is at least as effective as a conventional UVB lamp in the

Table I. *Irradiation scheme*

Day	311 nm lamp (J/cm^2)	Conventional UVB (J/cm^2)
1	0.07	0.015
2	0.14	0.03
3	0.21	0.04
4, 5	0.27	0.05
6, 7	0.32	0.07
8, 9	0.44	0.10
10, 11	0.59	0.13
12, 13	0.71	0.17
14, 15	0.89	0.20
16, 17	1.19	0.27
18, 19	1.49	0.34
20, 21	1.78	0.40

Table II. *Results of comparison II: Patients treated with 311 nm UVB lamps (+ anthralin) compared with conventional UVB lamps (+ anthralin)*

Clinical result	311 nm	Conventional
Good	9 (53%)	7 (30%)
Some improvement	7 (41%)	13 (57%)
No improvement	1 (6%)	3 (13%)
Number of patients	17	23

treatment of psoriasis as part of the Ingram regimen. Most of the patients experienced mild erythema (caused either by UVB or anthralin) during the treatment, but the frequency or severity of this erythema was no higher in patients treated with the 311 nm lamps.

It may seem surprising that more than four times higher UVB doses were needed for the 311 nm lamps to provide equierythemogenic doses with Sylvania lamps. However, this difference is explained by the fact that Sylvania lamps emit considerable amounts of irradiation in the wave length range 290–300 nm which is more than 10 times more erythemogenic than irradiation in the wave length range 310–315 nm (1).

The ideal UVB-lamp would be effective and safe, i.e. not carcinogenic. The 311 nm lamp has already been shown to be effective in the treatment of psoriasis. Theoretically, it should be safer than conventional broad band UVB lamps because it emits very little radiation in the wave length range of 290–300 nm. In mice, it has been shown to be less carcinogenic than broad band UVB (4). In man, no data on the long-term safety of the 311 nm lamps exist.

We conclude that the new 311 nm narrow band UVB lamp is at least as effective as conventional broad band UVB lamps in the treatment of psoriasis with the Ingram regimen.

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