# The Influence of Ultraviolet B Irradiation on the Excretion of the Main Urinary Metabolite of Prostaglandin $F_{1\alpha}$ and $F_{2\alpha}$ in Psoriatic and Normal Subjects

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The influence of ultraviolet B (UVB) irradiation on the excretion of the main urinary metabolite of prostaglandin $F_{1\alpha}$ and $F_{2\alpha}$ (PGF-MUM) in 7 normal male volunteers and 7 male patients with stable psoriasis was examined. The excretion of PGF-MUM was increased during the first 24 hours after UVB irradiation of back skin and was generally reduced to near pre-irradiation levels during the next 24 hours after irradiation, in both normal and psoriatic subjects. Although pre-irradiation levels of PGF-MUM excretion in psoriatic patients were lower than those in normal subjects as previously reported, it was demonstrated that PGF-MUM excretion after UVB irradiation in psoriatic patients was fairly increased and amounted to near the mean pre-irradiation level in normal subjects. These results suggested not only a disorder in endogenous prostaglandin synthesis in psoriatic patients but a considerable capacity of psoriatic skin to synthesize prostaglandin after UVB irradiation. *Key words: Psoriasis; Prostaglandin; The mean urinary metabolite of prostaglandin $F_{1\alpha}$ and $F_{2\alpha}$ (PGF-MUM); Ultraviolet B (UVB).* (Received January 3, 1983.)

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Disorders in the adenylate cyclase–cyclic AMP system have been implicated in the pathogenesis of psoriasis (1, 18). Prostaglandin (PG) is a modulator of adenylate cyclase and several authors have indicated a disturbance in PG biosynthesis in psoriatic epidermis (2, 7, 10, 14, 18). We previously demonstrated a reduced excretion of 5,7-dihydroxy-11-keto-tetranorprosta-1, 16-dioic acid, the main urinary metabolite of $PGF_{1\alpha}$ and $PGF_{2\alpha}$ (PGF-MUM) in psoriatic patients compared with that in normal subjects, which suggested a disorder in endogenous PG synthesis in psoriatic patients (11).

It is well known that irradiation of human skin by ultraviolet B (UVB) caused local increases in the concentration of PGs (3–5). In the present investigation, we examined 24-hour urinary excretion of PGF-MUM in psoriatic patients after UVB irradiation as an index of the capacity of psoriatic skin to synthesize PGs under the influence of UVB irradiation.

## MATERIALS AND METHODS

### *Human subjects*

Seven male patients with chronic plaque-type psoriasis involving 10–40% of their body surface (age range 30–80 years, mean 45.3) and 7 male normal volunteers who gave prior informed consent (age range 21–26 years, mean 23.3) were studied. Some of them were included in our previous report describing the excretion of PGF-MUM in psoriatic and normal subjects (11). They had no history of photosensitivity. They had not ingested any medication known to affect PG biosynthesis or photobiologic responses to UV irradiation during at least 3 months before this study.

### *UVB irradiation*

Five FL20S·E-30 fluorescent lamps (Toshiba Co., Tokyo, Japan) with a major emission at 290–320 nm and an intensity of 1.51 $mW/cm^2$ at a distance of 37 cm were used to irradiate each subject's back

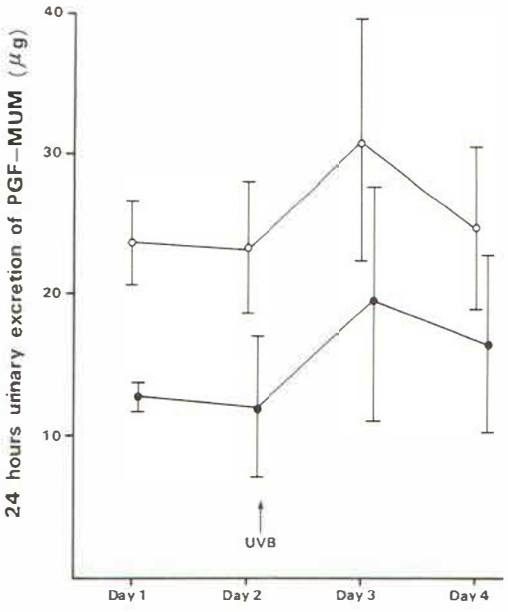


*Fig. 1.* Means ± standard deviations of PGF-MUM excretions 2 days before and 2 days after UVB irradiation, shown as open circles with bars (normal subjects) or closed circles with bars (psoriatic patients).

skin for 3 min at this distance. No topical treatment of the back skin was allowed for at least 2 weeks before and during this study.

*PGF-MUM analysis*

Twenty-four hour urine collection was carried out on 4 consecutive days. UVB was irradiated after the second 24-hour urine collection was completed. PGF-MUM analysis was done as previously reported (11).

## RESULTS

Data are summarized in Fig. 1. The levels of 24-hour urinary excretion of PGF-MUM in psoriatic patients before UVB irradiation were lower than those in normal subjects, as previously reported (11). Excretion of PGF-MUM was increased during the first 24 hours after UVB irradiation and decreased to near pre-irradiation levels during the next 24 hours, in both normal and psoriatic subjects, except in a few cases. The increase in PGF-MUM excretion after UVB irradiation was greater in psoriatic patients (mean ± SD, 63.3±37.6%) than that in normal subjects (34.8± 19.0%) but with no statistically significant difference ($p>0.05$, Student's $t$-test). However, increased PGF-MUM excretion in psoriatic patients after UVB irradiation (mean ± SD, 19.5±8.2 μg/day) came to near the mean pre-irradiation level in normal subjects (23.3±4.7 μg/day).

## DISCUSSION

The excretion of PGF-MUM was increased maximally during the first 24 hours after UVB irradiation and generally reduced to near pre-irradiation levels during the next 24 hours, in both normal and psoriatic subjects. This temporal change in PGF-MUM excretion after UVB irradiation is in close agreement with the previous study of Black et al. who demonstrated a maximum rise of $PGF_{2\alpha}$-like activity as well as $PGE_2$-like activity in the exudate from normal skin at 24 hours after UVB irradiation and only a slight rise in the activity at 48 hours after irradiation (3, 4).

The pre-irradiation levels of PGF-MUM excretion in psoriatic patients were lower than those in normal subjects, as previously reported (11) and the mean excretion level of PGF-MUM during the first 24 hours after UVB irradiation in psoriatic patients did not rise to the mean pre-irradiation level of PGF-MUM in normal subjects. These results seem to indicate a disturbance in PG synthesis in psoriatic skin. It is noteworthy, however, that PGF-MUM excretion in psoriatic patients was appreciably increased after UVB irradiation, which suggested a considerable capacity of psoriatic skin to synthesize PGs.

The cause of hyperproliferation of epidermal cells in psoriasis is unknown (18). However, several reports have indicated a disorder in PG biosynthesis in psoriatic epidermis in relation to the adenylate cyclase–cyclic AMP system (2, 7, 10, 14). Furthermore, inhibitory effects of endogenous and exogenous $PGE_1$, $PGE_2$ and $PGF_{2\alpha}$ on cell proliferation have been reported, e.g. in transformed fibroblasts (3T3 fibroblasts, L-929 cells) (9, 13), B-16 melanoma cells (17) and human skin epithelial cells (NCTC 2544 cells) (16). In practice, Jacobs & Jacobs demonstrated a curative effect of topical $PGE_1$, on psoriatic lesions (8). We also observed a favorable effect of topical $PGF_{2\alpha}$ and $PGE_{2\alpha}$ as well as of $PGE_1$, on psoriatic lesions (presented at the XVI International Congress of Dermatology, Tokyo, Japan, 1982). Thus it is conceivable that defective PG synthesis in epidermal cells is deeply involved in the pathogenesis of psoriasis.

In the present investigation, it was shown that psoriatic skin was induced to synthesize $PGF_{1\alpha}$ and $PGF_{2\alpha}$ in considerable amounts after UVB irradiation. UVB is an essential component of the Goeckerman regimen, whose remarkable effect on psoriasis is widely known. Although the therapeutic role of each component of the Goeckerman regimen, UV or tar products, has remained uncertain (12), several investigators have concluded that UVB alone can heal psoriasis (6, 15). From the present results, together with the previous findings (2, 6, 7, 10, 11, 14, 15, 18), we would like to consider that UVB inhibited epidermal cell hyperproliferation in psoriasis by enhancing PG biosynthesis in these cells. Whether or not PG exerts an antiproliferative effect via cyclic AMP remains to be elucidated in the future.

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