THE USE OF METHOXSALEN IN SUN TANNING

OTTO C. STEGMAIER, M.D.

Davenport, Iowa

This study concerns 30 volunteers with normal skin who were under methoxsalen therapy before receiving solar radiation as a protective measure against sunburn. Observations of skin responses to Black Light radiation comprises a corollary portion of the study.

The occurrence of an unusual bronzing of normal skin, while under psoralen therapy for vitiligo, aroused Fitzpatrick's curiosity (1). Many other vitiligo patients under his care noted that the normal skin and the depigmented skin could tolerate more sunlight without burning. Following these two observations the "Sun Tan Pill Era" was initiated and further exploration of this fascinating subject was begun (2, 3). This was the summer of 1953. Upon receipt of this information, the present study began.

METHOD

Since the summer of 1954, 30 persons with normal skin have been observed for this increase in pigmentation and decrease in burning (1) after ingestion of methoxsalen and exposure to solar radiation. Twenty-five of these were either blonds or red heads with fair skin which sunburned readily. Many of these had never enjoyed the summer months because of the severe burning and blistering which results from short exposures. Five other volunteers were placed on the psoralen to augment the normally acquired tan and to do so in a shorter period of time. The exposures to sunlight occurred while the volunteers were at work, on vacation, and particularly while around water during the noon hours of the summer months. No controlled studies with measured periods of sunlight nor with double blind placebos were attempted. The dosage of medication varied but most patients took 20 mgm., one to three hours before exposure to radiation. Since the most efficient method of administration was not known initially, some volunteers took 10 mgm.


three times a day after meals. In others, the dosage was as low as 10 mgm. a day. All of those cooperating have been under medication for at least three days a week for one summer, or daily for three weeks in Florida or Mexico in the winter. Two patients have been on medication each summer for the past four years. All of the volunteers were over 21 years of age except three. The results of liver function studies and blood counts before and after the experimentation were normal.

RESULTS

Fifteen of the 25 persons had excellent results in preventing severe sunburn following exposure to sunlight. Twelve of these fifteen could enjoy summer sports for the first time in their lives. Eight felt that the protective action had been helpful but these persons were not as enthusiastic as the other fifteen. Two of the volunteers stated the capsules were of no benefit in preventing sunburn. The best results were noted when methoxsalen was taken in early summer or when the volunteers were on winter vacations in the southern latitudes. Eighteen of the 25 appeared to be darker in color than on previous occasions without psoralens. This was substantiated by the volunteers' friends and relatives. While the double blind placebo tests were not performed, both of the above results (increased tanning and toleration) were diminished when the persons were off of the medication.

The five volunteers, whose skin had always tanned well, noted increased tanning and in less time than ever before (4). In three of five the skin assumed an intense chocolate brown color, particularly after vacation trips to Florida.

Three patients with atopic eczema had been on methoxsalen therapy last summer. They were placed on this therapy because the flexures of the arms did not tan as well as the remainder of the skin. All three of them showed repigmentation of these areas while on psoralen therapy. However, this winter the pigmentation began to disappear from these areas. Three patients with psoriasis were also under medication with sun-
light and psoralen therapy last summer after their disease had cleared under the Goeckerman regime. These three patients have remained free of this disease during the past winter. No definite conclusions can be drawn as to the relative effectiveness of the psoralens in psoriasis.

UNUSUAL INCIDENTS

One of the 25 volunteers, a 36 year old male, under medication with methoxsalen therapy, spent two weeks in the mountains in Colorado. Two months later a basal cell carcinoma of the skin developed. This man had no previous history of skin cancers, nor of previous arsenic administration or x-ray therapy to the skin of the face.

A fifty-one year old woman lost muscular coordination each time following methoxsalen therapy and sunlight exposure. Blood studies and liver function tests did not reveal anything abnormal.

Two of the 25 volunteers were children, ages four and five. During the second week of therapy a severe chelitis and marked edema of the feet forced cessation of therapy.

BLACK LIGHT AND METHOXSALEN

While the action spectrum of methoxsalen is not definitely known, Fitzpatrick stated that it potentiates the action of ultra-violet at 2900 Å and also at wave lengths longer than 3100 Å which pass through window glass (1). Elliott has demonstrated that following ingestion of methoxsalen and exposure to the Wood's light, which emits nothing shorter than 3400 Å, erythema and pigmentation results (5). Since the fluorescent black light lamp* emits most of its energy in the near ultraviolet, that is, greater than 3200 Å, it would appear to be an excellent source of light to use in conjunction with psoralens for further study and evaluation of the skin responses. (Fig. 1) These lamps emit radiation over a large surface, in contrast to the mercury vapor Wood's light. They are inexpensive—less than $2.00 per lamp—and no elaborate expensive equipment is needed to activate the lights. Therefore, they were selected for experimental usage.

METHOD

Four by four inch sites on the back of a 20 year old male with good tanning ability were used as test sites. A commercial fluorescent fixture, with baked enamel reflecting surface, housing three 48 inch, 40 watt black light fluorescent lamps was used as the source of irradiation. The distance from skin to the lamps was six inches. (Fig. 2) The right side was exposed to 30 minutes daily for 7 days (Area #1). The left side (Area #2) was exposed to the same amount, but preceded by the administration of 50 mgm. of methoxsalen daily. A biopsy specimen was taken from this site 11 days after the initial exposure. A third site (Area #3) was exposed similarly to Area #2 except that the radiation was filtered through window glass. The areas exposed were being irradiated with approximately 4286 footlamberts.

RESULTS

Area #1. No erythema developed. A faint pigmentation was noted within two hours after the start of the exposure and this darkening was only intensified after seven days of irradiation.

Area #2. Erythema developed in approximately 17 hours after the initial exposure. Pigmentation was noted at the end of the first
Fig. 3. Photograph of Area #2. This was taken nine days after the beginning of the experiment.
and since these rays were probably filtered out by the window glass, it would appear that methoxsalen taken orally potentiates the effects of near ultraviolet radiation (above 3200 Å) on the skin. This technic should prove to be an inexpensive artificial source of radiation to produce erythema and pigmentation and it should be applied in the treatment of vitiligo, psoriasis and other dermatological diseases on an experimental basis.

SUMMARY

1. In 25 normal persons, methoxsalen taken orally before exposure to sunlight provided protection against sunburn in 23 and produced increased pigmentation in 18.
2. It greatly potentiated tanning in five out of five volunteers studied.
3. Methoxsalen appears to increase the effects of black light fluorescent radiation on the skin when taken prior to exposure. It appears to intensify the near ultraviolet spectra (above 3200 Å).

REFERENCES

1. FITZPATRICK, THOMAS B.: Personal communications.
6. BECKER, S. W., JR.: Effect of 8-methoxypsoralen and sunlight on pigmentation and skin structure. Presented at the Fourth Annual Cosmetic Seminar, September, 1957.