# New Ultraviolet Monitoring Technology

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*There is a growing awareness of the hazards of ultraviolet (UV) radiation to the health of the community and to our environment's integrity. There is a need for monitoring this hazard. Until recently, UV radiation sensors tended to be relatively expensive. However, as a result of the introduction of mass-produced GaAs photodiodes in the late 1980s, UV radiation now can be measured more accurately, cost-effectively and conveniently. A new, low-cost sensor is availiable with a wavelength tailored to the skin's erythmal response without additional complex circuitry or filter elements; it can be used in a variety of settings.*

## Background

Sunlight's contribution to solar injuries and the development of skin cancer has been recognized since the beginning of the 20th century. While the photodamage spectrum traditionally has been considered as a set of conditions important for outdoor workers, it has become apparent over the past 2 decades that those who participate in outdoor recreation also are exposed to significant health risks.

The incidence of skin cancers has increased alarmingly over the past decade and forecasts anticipate an even more perilous epidemic. An important contributing factor to the epidemiologic shift of this disease has been the advent of economy-class air travel. In addition, the travel industry has furthered this outcome by advertising the "healthy tan", dismissing the warnings of dermatologists and ophthalmologists as alarmist.

In the past, concern about the negative effects of exposure to the sun focused on the UV-B wavelengths (290 to 320nm). Recently, however, it has become recognized that UV-A wavelengths (320 to 400 nm) should be monitored as well, for a more complete evaluation of sun-related health risks. Examples of this new concern already can be seen in the U.S., Canada, Europe and in other locations where sunscreens are formulated to provide UVA and UVB or broader-spectrum protection.

A heightened awareness of the risks of excessive UV exposure has been publicized through public health "safe sun" education campaigns and environmental concern over depletion of the stratospheric ozone layer. These influences together with the introduction of new UV-sensing and communications technology are in a timely position to help counter the present inattention to UV protection of one's person.

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As part of the new focus on preventive medicine in the developed world, public health programs promoting safe-sun awareness are being established rapidly. It is well recognized that Australia and New Zealand have been the most active in this area, mainly the result of rapid escalation of skin cancer rates in those countries.

Two problems exist that make promoting safe-sun behavior a challenge: The invisibility of UV radiation and the often negative tone of the educational message. How people spend their leisure time is a personal and controversial subject. Whereas the public may be aware of the dangers of excessive exposure to the sun's rays, overly negative propoganda can result in undesired reactions.

Hence, 2 elements should exist in the effective delivery of a practice safe-sun message: The first is to make UV radiation a measurable entity that can be understood and related to easily. The second element is a message that has enough emphasis on the dangers of excessive exposure without presenting the sun as something to be avoided at all costs. The latter point especially is important in sunny places where people live or visit.

The problem of the invisibility of UV radiation has been overcome with the development of new technology that makes available accurate and affordable sensors to measure UV wavelengths important to the skin. This development promises to alter significantly sun-oriented attitudes and behaviors and promote personal UV protection.

## Technology

The basic problem in providing accurate and affordable monitoring of the doses of UV radiation that affect the skin has been in the development of a low-cost sensor with a response that matches the reaction of the skin to sunlight. Conventional detector systems, using relatively bulky interface filter technology, provided solutions typically costing several thousand dollars.

The Environmental Monitoring Technology Ltd. (EMTEC), solution employs a miniature sensor that uses aspects of conventional semiconductor technology coupled with innovative optical technology—all at a dramatically lower cost. The response of the EMTEC sensor is closely matched to the known UVB-doses curve, including sensitivity to a UVA component, to best simulate the total effect of UV radiation on the skin. Innovative design geometry has achieved an excellent cosine correction factor which accurately detects radiation effects on the sensor from a wide range of angles. All of these features are essential for accurate monitoring of UV exposure. For these reasons, the EMTEC sensor is considered to be the founder of a new generation of UV monitoring equipment.

## Applications

EMTEC's range of products incorporates its revolutionary sensor and has the flexibility to adapt to novel applications in

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## LETTERS TO THE EDITOR *(continued from page 113)*

Editor's note:

Christine Trecker is a 20-year resident of Oahu. She lives on the windward coast with her husband and daughter and enjoys the indoors and outdoors. Her background is in marketing research and advertising.

She realized the need for this type of publication for our residents and our visitors as well. All profits from the book sales go to the Friends of Foster Kids. Books are available at Liberty House and most bookstores..

Norman Goldstein MD

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## NEW ULTRAVIOLET MONITORING *(continued from page 116)*

scientific and nontraditional settings. The EMTEC Uviscan™ PDU is a public display unit approximately 1 meter square (Figure 1). Data on UV intensity are displayed as individual "time-to-burn" values for each skin type. (The EMTEC Uviscan™ PDU has been calibrated for skin types 1 to 4.) The unit's display rotates through 360° to ensure maximum visibility from all surrounding areas. A measurement of UV is made at the beginnning of a series of 4 rotations; the unit then displays the estimated time-to-burn for each skin type. When the cycle is complete, the UV sensor takes a new measurement and the display values for each skin type are updated. Measurements are made every 4 minutes, though this rate can be adjusted to suit the unit's particular application. The unit is intended for installation in public recreation areas such as beaches and playgrounds; Figure 1 illustrates the positioning of the EMTEC

Figure 1: Copyright EMTEC Ltd

Uviscan™ PDU above a lifeguard station on Waikiki Beach in Hawaii, one of the first sites to employ EMTEC technology. The unit has been designed so that the display is visible from up to 100 meters away, even under the most glaring conditions.

Two similar but smaller devices are presently being designed: The EMTEC Uviscan™ Professional and the EMTEC Uviscan™ Domestic. The Professional has been designed for use in commercial establishments with high population density, where long-distance visibility is not essential. Hotel swimming pools and tennis courts are 2 typical applications for this device. The EMTEC Domestic has been designed for the home environment, again for use near the swimming pool or during children's backyard playtime.

EMTEC technology also makes possible accurate personal UV monitoring. The pocket-size EMTEC Uviscan™ Personal is an intelligent device that allows the user to insert his or her skin type, suncreen SPF number and the amount of sun exposure per day. The Uviscan Personal then displays the estimated time-to-burn. Every 30 seconds the unit takes new measurements and updates the display accordingly.

A final product is designed for use on children. It is non-programmable, allows for only 1 skin type (type 1) and the parent is required to apply a sunscreen of SPF 15 or higher to the child. In this manner, EMTEC hopes to encourage a relationship between the regular use of sunscreen and an adequate SPF number for the child's protection against the sun. The unit measures and records accumulated UV exposure and displays the accumulated dose in the form of up to "10 suns" on a liquid crystal display. When the tenth sun has appeared, an alarm sounds which means that the child should be taken indoors in order to avoid overexposure.

### Summary

The EMTEC sensors include a range of products appropriate for different uses in different locations. It is envisioned that this technology, used in conjunction with public health education, will have a significant impact on sun-oriented behavior. The message being delivered will be accompanied by quantified information directly useful for gauging sun exposure.

With the technological elements now in use, a low-cost, ground-based UV monitoring network can be established. EMTEC is actively establishing such a facility in association with interested organizations on a worldwide basis. Dissemination of this information will raise public awareness of skin cancer issues and assist institutions in vital research.

The development of the EMTEC sensor marks a new era in UV monitoring and places an emphasis on the responsible use of products based on new technology.

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## GENDER-RELATED ISSUES IN MALIGNANT MELANOMA *(continued from page 124)*

Centers for Disease Control (CDC) show that the death rate from melanoma in women increased 21% from 1973 to 1988 while the death rate for men increased 50%[6]. In fact, according to the CDC, the death rate for melanoma in men is increasing faster than for any other cancer.

### Conclusion

The incidence of melanoma is increasing most rapidly in women under 40 whereas the death rate from this tumor is rising more rapidly in older men. Because the only cure for this cancer remains early detection and treatment, increased public education and promotion of awareness among both women and men are needed in order to minimize the hazards from melanoma.

Editorial comment:

*Dr. Rigel is a "world authority" on melanoma.*

Norman Goldstein MD

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