

Current Comments

The Hazards of Sunbathing

Number 8

February 19, 1979

A common ritual one often observes in the office is that of the returning vacationer receiving compliments on a "fantastic" tan. I received that attention last year when I came back with a marvelous tan after a few days of cross-country skiing in Aspen, Colorado. No one noticed that I also had a pair of painful lips because I had failed to take the precaution of screening them from sun and wind.

Usually I'm more careful than that. I think I'm more aware of the potential dangers of the sun than most people. When I was fourteen, during a vacation in Miami, Florida, I fell asleep on the beach. The following week was a nightmare I'll never forget. Since then I have been told that I have a type of skin which is susceptible to cancer. Also, one of my oldest friends has suffered from skin cancer for 25 years. Nevertheless, I like the sun just as much as anyone else. So when friends want to go out for a day on the beach, I always wear a shirt and keep my head covered. I get enough exposure while swimming to tan very rapidly.

I am amazed at most people's casual attitude towards sunbathing.

I suppose that their neglect of sunlight's dangers derives from the fact that today a suntan is a status symbol. This was not always so. Harvard anthropologist Marvin Harris points out. For most of recorded history, white skin implied a lofty position in society. While workers, serfs, and slaves spent most of their time in the sun, aristocrats sought shade by carrying parasols, wearing hats and sunbonnets, and staying indoors. This kept their skin pale, which showed they had a lot of leisure time.¹

The industrial revolution did away with this pursuit of pallor. Workers, herded into factories, spent long hours indoors. Suddenly, Harris notes, "A pallid complexion ceased to be the prerogative of the parasol-wielding bluebloods....Industrialization made shade cheap and sunlight expensive."

Now pale skin seemed less attractive. A suntan showed that its wearer had the wealth and leisure to travel to places where he could get a lot of sun. The middle classes imitated the sun-worship of the rich, and they still do. A suntan, of course, does not necessarily indicate great wealth today. And

while many people think a suntan is a sign of good health, that is not necessarily the case.

Ultraviolet radiation is the part of sunlight that tans and burns the human skin. The most dangerous radiation is absorbed by the ozone layer, a 15-30 mile-high shield made of a form of oxygen.

Recently there has been concern that the ozone layer is being destroyed or eroded by man-made phenomena such as nuclear explosions, supersonic transport exhaust, or the release of fluorocarbons from aerosol cans and air conditioners. A depleted ozone layer, it is argued, will lead to a worldwide increase in the incidence of skin cancer.^{2,3,4,5,6} Such assertions, widely reported in the scientific and lay press, are controversial.^{7,8,9} If they are true, we are in trouble. But even if they prove to be false alarms, at least they have given us a new appreciation for the ozone layer and the dangers of overexposure to ultraviolet radiation.

The pigment melanin is the body's natural defense against ultraviolet radiation. Melanin is made by melanocytes, cells which lie deep in the epidermis. When ultraviolet rays penetrate the epidermis, they strike the melanocytes, which divide and produce melanin. When intracellular bodies called melanosomes carry the pigment to the skin's surface, the skin darkens. The tan resulting from the first exposure to sunlight offers protection against the next exposure.

Sunburn, or erythema, occurs when the skin is overexposed and has not produced enough melanin to protect itself. Researchers are not completely sure about the mechanism of erythema. They do know that ultraviolet light damages the cells in the epidermis, causing them to produce toxic compounds. Capillaries in the dermis are also damaged. This results either from the toxins from the epidermis, the direct action of the radiation, or both. When capillary cells are damaged, they swell up, causing the red color, heat, and pain associated with sunburn.^{10,11}

Ultraviolet radiation also damages the proteins that make up the skin's connective and elastic tissue. This leads to wrinkled, leathery, sagging skin.¹² Twenty-year-olds who overexpose their skin to sunlight may have skin looking like that of 40-year-olds by the time they are 30.¹³

Prolonged exposure to the sun can also cause scaly grey growths and dark patches called keratoses. These are often precancerous, according to the American Cancer Society.¹⁴ Not everyone agrees with that assertion, however. Ronald E. Davies of Temple University's Skin and Cancer Hospital in Philadelphia is one dissenter. "There is precious little evidence that keratoses become cancer," he says. "That skin cancer is very often associated with sun-damaged, keratotic skin is absolutely true, but the evidence for progression in humans is lacking."

The worst that sunlight can do, everyone agrees, is cause skin cancer. In fact, sunlight has been called "the most ubiquitous carcinogen of all."¹⁵ Most likely, skin cancer occurs when ultraviolet light damages the DNA in skin cells.¹⁶ If the DNA is not repaired, or is repaired incorrectly, the result can be a tumor.

Skin cancer was first linked to sunlight around 1900 by dermatologist William Dubreuilh of Bordeaux, France. Dubreuilh blamed the high incidence of skin cancer among Bordeaux vineyard workers on overexposure to the sun. By 1910, other researchers in the US, England, and Italy also undertook clinical observations and published their findings. The idea that sunlight leads to skin cancer was widely accepted by dermatologists even then. They believed that skin cancer occurs more frequently on bodily parts that receive the most sunlight, that skin cancer occurs more often among whites in parts of the world that get the most sun, that fair-skinned people are more apt than dark-skinned people to get skin cancer, and that people who work outdoors have a higher incidence of skin cancer.¹⁷

These views have since received wide support. Today, the American Cancer Society estimates that about 300,000 cases of skin cancer in the US are sun-related, and about 5,000 Americans die each year from skin cancer.¹⁴

Here are three types of skin cancer. Basal cell carcinoma is the

most common type among white persons.¹⁸ Tumors associated with this kind of cancer do not spread readily. Basal cell carcinoma is usually not fatal if treated early. It usually occurs on the face and, if untreated, disfigures it.⁵

Squamous cell carcinoma usually affects the upper extremities and the exposed parts of the body. This too is usually not fatal if treated early.⁵ Both squamous cell and basal cell carcinoma occur in the epidermis.

Melanoma is less common than the other two kinds of skin cancer, but causes most skin-cancer-related deaths. Forty percent of the people with this type of cancer die within five years of its onset. Though it begins in the melanocytes, it spreads easily to other parts of the body.⁵

Frederick Urbach of Temple University's Skin and Cancer Hospital says it takes at least 10 to 15 years for periodic overexposure to the sun to cause cancer. Squamous and basal cell carcinoma can be caused by ultraviolet light acting alone. Sunlight, he says, may be a factor in causing melanoma, but this remains unproved. Melanoma does not always originate on body parts most often exposed to the sun, such as the face, neck, back, or backs of hands, he says.

Though death by melanoma has increased greatly since the 1920s, its victims are often professional or managerial workers, not workers who spend their days in the sun. One possible cause of melanoma is

the action of ultraviolet light on certain moles, some of which may be caused by one's genes. Viruses or chemicals have also been implicated.¹⁹

Laboratory studies on animals have suggested that ultraviolet light plus certain chemicals can cause skin cancer more readily than light or chemicals alone.⁵ According to Urbach, coal tar derivatives fall into this category. So do psoralens—chemicals found in some grasses, green plants, and the skins of citrus fruits. Psoralens are used in drugs for treating the skin diseases psoriasis and vitiligo, and are also found in some perfumes. However, Urbach says, since most people don't come into contact with psoralens or coal tar derivatives for long periods of time, these substances are probably not a major cause of cancer in humans. Still, he says, they make the skin sensitive to sunlight. So they may act with ultraviolet light to make sunburn more severe.

Early detection is the best known defense against skin cancer, whatever its cause. Skin cancer's early warnings are sores that don't heal, changes in the size or color of warts or moles, and the development of unusual pigmented areas.¹⁴

Although too much sunlight can cause much harm, moderate doses can be beneficial. Sunbathing can stave off infection by killing bacteria and fungus on the skin. Exposure to the sun can also relieve asthma and aching joints.¹²

Ultraviolet radiation helps the body produce vitamin D₃, or calciferol, by activating a precursor of the vitamin that is present in the human skin. Vitamin D₃ is necessary for the bones to absorb calcium. Lack of the vitamin causes rickets, a crippling disease that occurs when the bones lack calcium. Vitamin D₃ is also found in oily fish, like tuna or salmon. A close relative of vitamin D₃, the synthetic vitamin D₂, can be found in milk and some other foods that have been irradiated with ultraviolet rays.^{10,11} Rickets can be cured by exposure to low doses of ultraviolet radiation. The dose is about 5% of the amount that causes sunburn.¹²

It is highly possible that light, including the sunburn-causing ultraviolet wavelengths, has other therapeutic uses. In the USSR coal miners are dosed with small amounts of ultraviolet radiation. It is believed that this helps protect them from black lung disease, but how this is supposed to help is not known.¹² The US Navy, according to a report in *New York* magazine, irradiates its submarine crews with full-spectrum light. The results of this, reporter Catherine Houck writes, have been less illness and, intriguingly, greater emotional well-being among the sailors.²⁰

Indeed, one of sunlight's most welcome effects is the feeling of euphoria it brings to most of us. "Why do we feel elated on sunshiny days but depressed in cloudy, 'dreary' weather?" asks der-

matologist Farrington Daniels. The pleasant emotional effects of sunlight may be psychological. But there is evidence that they may have a biochemical basis.²¹

Light may indirectly affect brain chemistry and hormone secretion in humans, according to Richard J. Wurtman of the Massachusetts Institute of Technology's Laboratory of Neuroendocrine Regulation. In rats, birds, and reptiles, photoreceptive cells in the retina affect the pineal gland's secretion of a hormone called melatonin (not to be confused with the pigment melanin). In these animals, melatonin induces sleep, changes electroencephalograms, raises the level of the neurotransmitter serotonin, inhibits ovulation, and affects the hormone secretions of the pituitary, adrenals, and gonads.

Though melatonin seems to be an important hormone, its overall purpose is not known. What is known, however, is that the amount of melatonin produced by the pineal glands of these animals is inversely proportional to the amount of sunlight that falls on the retina.

The human pineal gland produces melatonin, too. Wurtman and his associates found that the level of melatonin in physically normal humans is highest between the hours of 11 p.m. and 7 a.m., during which most of us are asleep. This rhythm is missing in blind persons, however. The levels of other hormones also vary with the day-night cycle.^{10,11}

It isn't certain, though, if the levels of melatonin and other hormones in humans have anything to do with light. Their levels could, for example, be regulated by internal "biological clocks," writes Wurtman. But his findings do indicate that sunlight may have some effect on our glands and brains. Wurtman thinks we may be missing some unknown health benefits of full-spectrum light, since we spend so much time indoors under fluorescent and incandescent light. More research, however, is needed, he says.^{10,11,20}

If sunlight has its benefits, it is possible to enjoy them while minimizing the risks. The American Cancer Society says the best time to avoid the sun is from about 10 a.m. to 3 p.m. local time.¹⁴ In most parts of the world, when the sun is highest in a clear sky, ultraviolet exposure is greatest. At early morning or late afternoon, however, sunlight hits the surface of the earth at greater angles. Exposure is less because the rays' slanted paths take them through more of the atmosphere than at solar noon.

The time of year is a factor, too. The northern third of the US receives 15 times the amount of skin-damaging radiation in June than in December.^{10,11} However, potential exposure is the same in late April as it is in late August, Temple's Ronald Davies says.

Sunbathing hours should be adjusted to take into account latitude and altitude. There is less ozone in

the atmosphere at the equator, so the tropical latitudes receive more ultraviolet. And the greater your elevation, the more ultraviolet you are exposed to.¹⁴ That's why I was fooled by the "mild" conditions in Aspen last year.

A person can become sunburned even when sitting in the shade. As much as one-half to two-thirds of the ultraviolet radiation arrives at the surface of the earth via atmospheric scattering, according to Urbach and Davies. Ultraviolet radiation comes not just from the sun, but from the entire sky. Thus, a hat or an umbrella may be effective against the radiation that comes directly from the sun, but a person can still get burned by the scattered, diffuse radiation.²²

This problem is compounded in the presence of a good reflector of sunlight. Snow reflects almost 100% of the sunlight that strikes it, according to Kendric C. Smith of the Stanford University School of Medicine's Department of Radiology. Therefore, skiers are frequently burned by the radiation not only from the sun and sky, but also radiation reflected from the ground. Sand is also a good reflector, though not as good as snow.

Many people mistakenly think that staying in the ocean or a swimming pool will protect them from sunburn. Water, though, is transparent to ultraviolet light, Davies warns. A person who stays in the water too long may escape the sensation of heat, but risk a severe sunburn.

Water's transparency to ultraviolet light also explains how you can get burned on a hazy day. Exposure to ultraviolet light can be just as high as it is on a sunny day, says Davies. Scattering is greater than usual on such days, he adds.

The amount of pigment in your skin also determines how much ultraviolet light it takes to tan or burn. People with fair hair and skin burn more readily than dark-skinned people. People of Celtic ancestry are more likely to get skin cancer than blacks.^{14,22}

Chemical sunscreens can be an important defense against overexposure to ultraviolet radiation. A 1965-70 study by researchers from the Massachusetts General Hospital and Boston's General Hospital determined that para-aminobenzoic acid (PABA) mixed with ethanol provides the best protection. This solution is available in most drug stores under various name brands.^{23,24}

Sunscreens do not provide complete protection, however. A Food and Drug Administration advisory committee recently recommended that the following warning be placed on all sunscreen products: "Overexposure to the sun may lead to premature aging of the skin and skin cancer. The liberal and regular use of the product may reduce the chance of premature aging of the skin and skin cancer."²⁵

Perhaps the most important precaution is to limit exposure to the sun. The American Cancer Society advises sunbathers to apply

a PABA solution 45 minutes before going into the sun, and to limit exposure to 15 minutes at a time. Forty-five minutes is time enough for PABA to form a chemical bond with the epidermis.^{14,24}

The dangers of sunbathing have been known and publicized for many years. Yet many people still behave as if the body can be exposed to ultraviolet light indefinitely, with no ill effects. This may reflect the power of fashion, which today demands a tanned skin. Or is

it possible that people are so numbed by bad news about food additives, drugs, and environmental pollutants that they consider sunshine just another link to cancer that they cannot control? Many people today feel that cancer is just another disease you won't get if you are lucky enough. This is an unfortunate attitude in this instance. To ignore the hazards of sunbathing is foolish when a little precaution is all that is needed to safely enjoy the sun.

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