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Crew Awareness of Sunlight Exposure Can Help Prevent Skin Cancer

Flight crews and cabin crews should take precautions against exposure to the ultraviolet rays in sunlight while on airport ramps and during layovers.

Stanley R. Mohler, M.D.
Wright State University School of Medicine
Dayton, Ohio, U.S.

Flight crew members are at risk of developing skin cancer as a result of time spent on airport ramps and while outdoors during layovers, both of which can expose crews to excessive amounts of ultraviolet (UV) rays.

The major cause of skin cancer is excessive exposure to UV light rays. Sunlight is the major day-to-day source of UV light, and a certain amount is beneficial. (The body produces vitamin D in response to exposure to sunlight.) But overexposure to sunlight, and particularly a severe sunburn, can significantly increase skin cancer risk. Excessive exposure in suntanning parlors should be avoided.

The extent of exposure to UV rays in sunlight is influenced by elevation, latitude and cloud cover. UV-ray penetration is greater at higher elevations because the thinner atmosphere offers less filtering. The sun's rays are stronger and more direct closer to the equator. Crews that fly to destinations with a combination of tropical or desert climate and high altitude should be especially cautious. Cloud cover blocks some UV rays, however, and areas with frequent cloud cover may have a UV-ray level that is 50 percent lower than areas that are generally sunny.

The portion of the electromagnetic energy light spectrum that is visible to humans is between the wavelengths of 380 nanometers (nm) to 760 nm (a nanometer is one millionth of a millimeter). At the end of the low-frequency portion of the light spectrum is the UV range (400 nm to 180 nm). The human retina does not detect light rays in this range, and it is defined, therefore, as invisible light. Nevertheless, UV rays are absorbed by human tissues and produce damage to cell genetic structures.

The beginning of the UV spectrum is arbitrarily divided into the UVA range (320 nm to 400 nm) and the UVB range (290 nm to 320 nm), with subsequent wavelengths becoming shorter and shorter. At the extreme low end of the electromagnetic spectrum are X-rays, which are so short that some of them can pass through human-body tissues without being absorbed.

Skin cancer should not be feared excessively, but symptoms of a developing skin cancer must not be disregarded. Any unusual skin change, especially on the face, neck, shoulders and arms, should be examined by a physician.

The growth of cancer cells in the body leads to the death of normal tissue. Each cell of the body contains a genetic code that tells the cell when to divide and when not to divide. A cancer cell is a formerly normal cell that has lost its genetic code. The marauding cancer cells produce their own death when they bring down the host within whom the cells originated.

All types of skin cancer are serious, but the least serious (though not to be ignored) is basal-cell carcinoma, the most common of all types of cancers. The next-most serious type of skin cancer is squamous-cell carcinoma, and the most deadly is the type known as melanoma, or malignant melanoma.

No one knows exactly how many skin cancers occur each year. In the United States, the American Academy of Dermatology (AAD) estimates that about 750,000 persons will develop basal-cell carcinoma. Few of these will die of the cancer, because of its very slow growth rate and often successful treatment. The AAD estimates that squamous-cell skin cancers claim about 2,300 lives each year and that 6,800 lives are claimed by melanoma.

Melanoma Risk Is Higher Than Ever

The risk of melanoma has increased dramatically in recent decades.[1] In the United States, there is a one-in-87 chance of developing melanoma during one's life, an increase of 1,800 percent since 1930. Melanoma is the most frequent type of cancer among U.S. women aged 25 to 29 and the second most frequent among women aged 30 to 34.

Many other countries, including Australia, Austria, Canada, Germany, Italy and Scotland have also experienced a rising rate of melanoma, according to the AAD. It has been suggested that depletion of the ozone in the stratosphere, which is a natural filter against UV rays, is responsible for the rise in the incidence of melanoma.

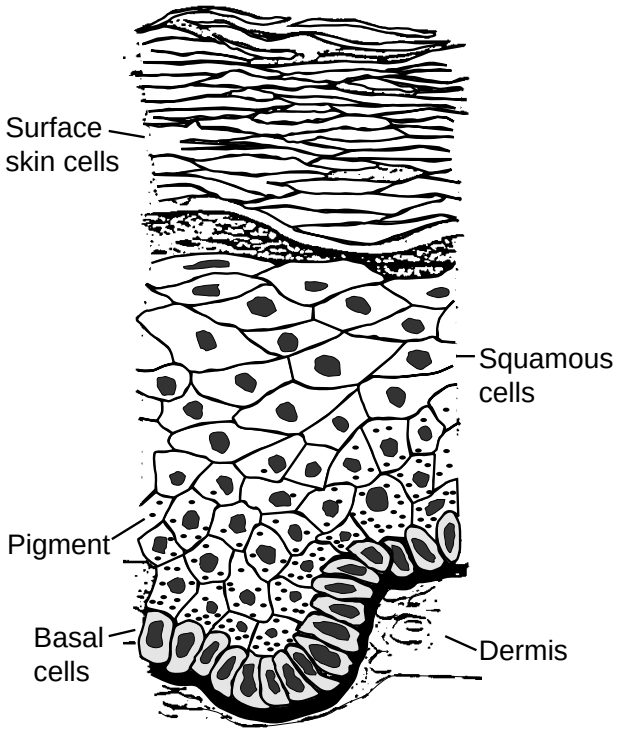
The top layer of the skin, called the epidermis (Figure 1), is thinnest in non-weight-bearing areas, thicker on the soles of the feet and thickest where repeated pressure causes calluses, for example, on the palms. Squamous cells are cells close to the surface; basal cells are deeper beneath the surface.

Pigment is produced near the basal cells, and pigment production increases as the skin absorbs UV rays. As squamous cells multiply, they are pushed toward the skin surface, flattening as they move outward. These cells ultimately die and become the dense, toughened outer skin layer.

The basal layer of the skin contains column-shaped cells that form the supporting foundation for the epidermis. The basal cells in fair-skinned persons are especially susceptible to genetic damage as a result of UV-ray exposure. When a cell's genetic material is changed, the cell may begin to divide in an ungoverned way.[2]

Randomly and rapidly dividing cells are the beginning of basal-cell carcinoma, the most common form of skin cancer. They form a growing cluster that presses on nearby normal cells, disrupts the distribution of nutrients to the normal cells and leads ultimately to their death. As the basal cells continue to multiply, they outgrow their blood supply and some begin to die.

Cross Section of the Top Layer of Human Skin (Epidermis)



Source: Stanley R. Mohler, M.D.

Figure 1

Basal-cell carcinoma usually starts as a small growth of cells about one millimeter to two millimeters (0.04 inch to 0.08 inch) across on the surface of the skin that may have a tiny cluster of capillaries at the center. Gradually, the cells in the center die and slough away, and the ring of growing cancer cells slowly becomes larger.[3] The tissue may take on a slight pink color. Various types of superficial (skin-surface) treatment can eradicate the cancerous growth at this stage.

Squamous-cell carcinoma is a slow-growing type of cancer that can spread to other parts of the body if cancerous cells enter the bloodstream. This type of cancer is very dangerous, and it can appear initially as a small cluster of cells that forms a lesion, or sore, that does not heal.

The amount of pigment in an individual's skin is determined by heredity. The pigment protects against solar UV rays, and, accordingly, populations that have lived for many generations near the equator tend to have darker skins than those with a polar ancestry.

Melanoma cells contain melanin, a dark brown-to-black pigment. Melanoma cells can stimulate growth in nearby capillaries, thereby bringing nourishment to the cancer cells. This ability to obtain nourishment, along with other attributes

involving immunologic factors, leads to very rapidly spreading melanoma cancers.[4]

Avoidance of excessive UV-ray exposure, especially by those who are at higher risk for developing skin cancer, is a primary preventive measure. Individuals with a genetically higher risk include those with very fair skin; those with blond or red hair; those with blue, hazel or other light-colored eyes; and those whose fathers and mothers have shown a susceptibility to skin cancer.

Protective measures include wearing a broad-brimmed hat during daylight and using a solar-protective cream that has a sun-protection factor (SPF) rating of 15 or higher. The AAD and the U.S.-based Skin Cancer Foundation recommend that sunscreen be reapplied every two hours, even on cloudy days, and after swimming or perspiring. It is particularly important to avoid unprotected exposure to sunlight during the most intense period of sunshine, between 10 a.m. and 3 p.m.

Sun Tan Will Not Prevent Cancer

Tanning is the skin's natural response to exposure to UVA rays, but it does not prevent skin cancer. UVA rays are used in suntanning parlors because they trigger the deposition of melanin, but a tan produced by exposure to UVA rays offers skin protection only at the SPF-3 level.

UVA-ray exposure produces direct skin damage, and there is an underlying connective-tissue response to this injury that produces a thickening of the collagen in the skin. Collagen is the fibrous "mat" that gives toughness and resilience to the skin.

Suspicious-looking lesions should be surgically removed before they have time to become more advanced forms of skin cancer.

Fair-skinned people who spend a lot of unprotected time in the sun, such as farmers, sun bathers and those who frequent tanning parlors, tend to have tough, wrinkled, parchment-like skin by the time they reach middle-age. This thickened skin is a product of the body's attempt to repair its repeated injuries. Exposure to UVA rays can also promote the conversion of normal cells into cancer cells.

UVB rays penetrate the skin more deeply than UVA rays and destroy bonds in the genetic makeup of underlying skin cells. This type of cell damage can trigger the conversion of a normal cell into a cancer cell. Exposure to UVB rays causes sunburn, "actinic keratoses" (the overgrowth of thickened, dead skin cells that form small "blotches" a few millimeters in diameter that fail to heal) and skin cancer. Sunscreens provide protection from both UVA rays and UVB rays.[5]

There is epidemiological evidence that exposure to certain petroleum products, coal tar–distillation products and/or arsenic dust can facilitate or cause skin cancer. Workers in industries where exposures to these substances can occur are at risk for developing skin cancer.

When signs of skin damage appear — for example, a small actinic keratosis — steps can be taken to stop further growth. Dermatologists can apply liquid nitrogen as a spray or as a tiny "dab" to the actinic keratosis. In addition, if there are multiple such lesions, 5-fluoro-uracil (5-F-U) can be applied in a schedule guided by a dermatologist. This eliminates all overt lesions and early lesions that are not yet visible. This procedure causes the affected area to turn bright red and develop an itching sensation, but the procedure is successful in almost every case to eliminate the lesions and prevent the skin cancer from spreading.

Suspicious-looking lesions should be surgically removed before they have time to become more advanced forms of skin cancer. All moles, especially those that are blue-black and slightly raised, should be removed. A newly discovered, localized basal-cell carcinoma, squamous-cell carcinoma or melanoma should be promptly removed.

Surgical removal of skin cancer often involves a procedure in which the edges of the area surrounding the newly removed cancer are sampled and sent to a laboratory for immediate evaluation and report to the surgeon. If cancer cells remain in these unclosed edges, the process is repeated and more skin is removed until the edges are found to be free of cancer cells. The skin edges are then pulled together and sewn with material that is absorbed by the body during the following weeks, leaving very little scarring or other evidence of the surgery.

Follow-up Treatment May Be Necessary

If squamous-cell carcinoma or melanoma has spread to nearby tissues or to lymph tissues, more complicated follow-up treatment is necessary.

If a recurrence develops after primary treatment of cancer, follow-up treatment can consist of further surgery at the margins of the original surgery. This may involve dissection and removal of tissues or lymph nodes into which cancer has spread. [Lymph nodes are part of the lymphatic system, a network of fluid containing white blood cells that drains blood vessels of their waste products.]

Further measures can be applied if, after primary and secondary treatment, there is evidence that cancer still exists in the cells. These measures include radiation therapy (X-rays) and administration of anticancer drugs and/or advanced immunologic techniques, some of which are still under development.

Usually, skin cancer is readily visible on the skin, and almost all skin cancer can be successfully treated before it begins to spread. Medical examination should be sought at the first sign of skin changes that are consistent with early forms of skin cancer. Early treatment (removal by surgery or other means) of skin cancer can almost always bring about a complete cure.♦

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About the Author

Stanley R. Mohler, M.D., is a professor and vice chairman at Wright State University School of Medicine in Dayton, Ohio, U.S. He is director of aerospace medicine at the university.

Mohler, an airline transport pilot and certified flight instructor, was director of the U.S. Federal Aviation Agency's Civil Aviation Medicine Research Institute (now the Civil Aeromedical Institute) for five years and chief of the Aeromedical Applications Division for 13 years.

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