MEDICAL HISTORY

SOLAR THEOLOGY, HELIOTHERAPY, PHOTOTHERAPY, AND BIOLOGIC EFFECTS: A HISTORICAL OVERVIEW

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Beginning with his primitive existence, man has interrelated with nature, made his own history, and made his own religion.[1] In this essay, I shall briefly describe an ancient Egyptian religion, sun worship, that reflected the images and fantasies inspired by nature. In addition, I will expand on the use of sun therapy for the cure and prevention of diseases in man and review the relationship of certain etiological factors with the occurrence of skin cancer and some baneful and beneficial conditions in man.

Ancient Egypt, favored by rare rain and saturated with the light and warmth of a brilliant sun in glorious splendor, embraced the sun as a god. This god was vividly visualized as a ram-headed sun god wearing a sun disc and sailing across the heavens in daylight from east to west in a celestial boat, and from dusk to dawn sailing on a river in a dark tunnel from west to east. In his daily tour, the rays of the sun god touched everyone and everything, gave life and fruitfulness, and brought light, warmth, and joy.

The Pharaoh Amhotep IV of the 18th dynasty, who ruled from 1801 to 1792 BC, worshipped the sun as the supreme and only god. He abolished the cult of Amon, banished all other gods, to the bitter resentment of their priests, and established a monotheistic religion. In a city on the Delta, named Heliopolis by the Greeks, the devotees invoked their sun god with fervent and solemn incantations in order to bring them cures and prevent disease.

The temples and surrounding cities have long since vanished and little is left to testify to the sun god's resplendent past.[2] In ancient times, people held the belief that rain was distilled from oceans and rivers by the heat and the power of the sun.[3]

Heliotherapy and phototherapy, the natural offspring of solar theology, whose romance with light and sunshine has remained a permanent legacy throughout the ages, have led to much good medicine and much bad medicine. Moses, who brought his people out of slavery in Egypt, legislated against pagan sun worship, but not its healing qualities. The Talmud recognized that the sun "carries healing in its wings" (Malachi 3:20). A biblical story tells of Jacob limping due to an accident, and the "Sun rose upon him," which was interpreted by Rabbi Berachaya to mean, "The sun shone upon him in order to heal him" (Genesis Rabbah 78:5).[4] Maimonides (1135–1204) describes the sun as the light and the warmth of the world, but warns not to let blood in the sunny season (personal communication, Fred Rosner, MD, July 1988). The Vedas, a sacred book of the Brahmins, teaches that the sun is the agent of life and the principle of thought, and that man breathes in both sunlight and air to become part of his life.[3]

In the classical era, gods took human form and functions, as with Mars and Jupiter; nonetheless, the healing powers of the sun were recognized. Ancient Greeks anointed their bodies and exposed themselves unclad to the rays of the sun on the flat roofs of their dwellings. The Greek physician Hippocrates taught that water and sunshine blended together in the human body to produce the most healthy of conditions. Romans indulged in sunbaths in their solaria (Heliosis) which was followed by cold sponging. Caelius Aurelianus, a Roman physician of the 5th century, prescribed

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sunbaths for a wide range of diseases. Romans named the spring water in Bath, England, "Aquae Sulis," for the water brought health to those who drank it.[5] Both Greeks and Romans linked mountain streams to aqueducts that extended over long distances to assure contact of water with the sun and air before the water reached their cities.[3]

During the Middle Ages, heliotherapy was forgotten in Europe. The hierarchy of the church frowned upon prying into the origins and life processes of plants, animals, and the planets. Sunbaths were not practiced by the oligarchy; but it is possible that the ragged, oppressed serfs discovered and enjoyed the thankful light and warmth of the sun as they labored on the land belonging to the lords and the church.

Heliotherapy and phototherapy reappeared and flourished in the 19th century. This was aptly addressed in a poem by Oliver Wendell Holmes (1809–1994):

The terraced hillside town
Where healing streamlets run
Still sparkling with their renown
The "Waters of the Sun."

In Veldes, Switzerland, a physician advised patients with certain diseases to expose their naked bodies to the sun. To provide artificial sunshine, the ultraviolet lamp was advanced by a Berlin doctor for the treatment of skin disorders. However, the true founder of scientific and practical phototherapy and heliotherapy was Niels Ryberg Finsen (1860-1904). He laid the foundations for light and sun therapy in tuberculosis of the skin, bone, and joints; and before his death, Finsen predicted the value of slow body tanning in the treatment of lung tuberculosis.[6,7]

Finsen was born in Iceland, December 15, 1860, and at the age of 20 left to live in Denmark where, in 1890, he received the MD degree. His health began to deteriorate when he was 23, he was an invalid at the age of 30, and died of adhesive, constrictive, pericardial disease September 24, 1904, at the age of 44.

In his homeland of little sun, Finsen, enchanted by its wonders, burst into poetic prose: "Insects that were drowsy awaken and take away, lizards and snakes come out to sun themselves, and the birds burst into song." Finsen felt the power and the need for light and sun: "All that I have accomplished in my experiments with light, and all that I have learned about its therapeutic value has come because I needed light so much myself. I longed for it so."[8]

Finsen's first publication in 1893 stemmed from the keen observation that smallpox lesions of the face and hands that are exposed to the rays of the sun become pitted, whereas, the covered parts of the body remain scarless. Finsen advised excluding from the sick room, the sun's burning, blistering chemical rays with heavy red curtains that permitted only the warming, nonburning and nonblistering red rays to enter.[9] This contribution to the therapy of smallpox gave Finsen instant fame in Norway and Sweden where the practice was adopted.

Finsen's ideas and dreams concerning phototherapy were realized when a man suffering from severe facial lupus vulgaris, and whose distress and embarrassment became so unbearable that he contemplated suicide, came to his attention. Finsen used a carbon arc light available at the Copenhagen Electric Light Station and, through a series of lenses, directed the powerful, concentrated light rays into the disfiguring, eroding lesion. Finsen found a cure (1896), the first in the history of medicine, and was awarded the Nobel Prize in 1903.[10]

Finsen was made director of the newly created Copenhagen Light Institute where he and his associates could freely conduct their investigations. Seeking a quicker and better method for the treatment and cure of lupus vulgaris, Finsen found a cure in 3 months when he discovered light rays passing through quartz, and, simultaneously blocking the painful, blistering burns of the germ killing, stimulating chemical rays with running cold water.

Finsen's disciples, Oscar Bernhard and Augusta Rollier, high up in the alpine mountains of Switzerland, reported that very slow tanning in the sunshine, combined with fresh air, rest and nourishment, transformed sickly tubercular patients into strong, tanned bodies that were free of the disease. Ove Strindberg, an associate at the Institute, submitted victims of tuberculosis of the larynx, seen as a fatal illness, to both light and sun therapy with good results. He found that few patients required the application of the electric cautery.[7]

Finsen's papers were translated into German, French, Italian, and English, and created enthusiasm and followers all over the world.[10] In the United States, Horace La Grasso at the J.N. Adam Memorial Hospital in Perrysburg, New York, Edgar Mayer at Saranac Lake, New York, and Alexis Forster at Colorado Springs, Colorado, all found direction and success in the treatment of tubercular disease.

The connection of skin cancer to the rays of the sun

continued on page 520

continued from page 518

has in recent years preoccupied both medicine and environmental scientists.[11,12] In areas of high concentration of sunlight, as in Florida and Australia, older adults are apparently prone to skin cancer. It must be kept in mind, however, that the case for ultraviolet as an agent for skin cancer is based on the speculations of earlier dermatologists, suggestive epidemiologic evidence, and the results of animal experiments.[13] Furthermore, it has not yet been demonstrated that ultraviolet can penetrate to the basal cells, nor that it can produce the chromosome aberrations characteristic of malignancy.[14,15]

The recent discovery of areas of depletion in the stratospheric ozone layer, which shields the earth from excessive and malevolent ultraviolet, has become of increasing concern. The erosion is caused by chemical pollutants, such as chlorofluorocarbons, methane, CO, CO_2, and nitrous and nitric acid, can seriously affect human health. It is claimed that the strong penetrating ultraviolet can induce DNA damage and increase the possibilities of eye injuries, such as photokeratitis and cataracts. In experimental animals, the interactions between ultraviolet and the immune system are involved in the pathogenesis of lupus erythematosis and neoplasia.[12]

There is still no proof that the intense ultraviolet penetration due to ozone depletion produces human cancer. There is however, mounting evidence that exposure to ionizing radiation may be critical to the initiation and progression of cancer.[14,16] This is equally true of the exposure of skin surfaces to alpha radiation, as well as for x-rays. Alpha radiation penetrates to basal cells and is an effective mutagenic agent capable of producing the structural changes found in human skin tumors.[12] Alpha emitters and radon decay products on exposed skin surfaces will readily penetrate to basal cells, the site of skin cancer.[17,18] The highest incidence of skin cancer has been observed in uranium miners, farmers, agricultural workers, and textile workers exposed to high concentrations of dust particles of radon progeny on vegetation surfaces.[18]

The discovery that visible light can be used to influence bilirubin metabolism was one of the valuable contributions in the 20th century. Cremer, in 1957, observed that bilirubin is highly photosensitive in vitro. Subsequently, extensive studies showed that blue light absorbs the pigment molecule and converts it to biliverdin that is easily excreted. A low pressure mercury fluorescent tube with filters to eliminate

continued on page 521

continued from page 520

ultraviolet emissions can be safely used in jaundiced newborns to prevent both brain damage and the need for therapeutic exchange transfusions.[19-21]

In summary, it has been shown, in this historical overview, that sun worship, inspired by nature, dominated in ancient Egypt and that its natural consequences were heliotherapy and phototherapy. I have described the major contributions made in the treatment of tubercular conditions by their proponents, particularly by Niels Ryberg Finsen, and reviewed the value of phototherapy in the management of bilirubinemia in the newborn. I have given an account of the several etiologic potentials for skin cancer and of the threatening effects to human health in the continuing erosion of the ozone layer by chemical pollutants.

In conclusion, solar theology, heliotherapy, and phototherapy constitute an instructive and fascinating episode in the history of medicine. The influence of ultraviolet and other etiologic factors on the occurrence of human skin cancer and serious biologic effects have become challenging problems to medicine and to the environmental scientists.

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