

# The evolution of current medical and popular attitudes toward ultraviolet light exposure: Part 2

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The 1920s and 1930s represented an extraordinary time in the shaping of modern attitudes towards ultraviolet light. Dermatologists and other physicians today are still confronting the effects of changes in social behavior that occurred at this time. The discovery that ultraviolet wavelengths played a role in vitamin D synthesis in the skin ushered in a period of enormous popularity for ultraviolet light exposure. A variety of other medical claims were soon made for ultraviolet radiation, including that it increased resistance to disease. The field of phototherapy rapidly expanded, and its use was employed by proponents for a host of unlikely medical conditions. Exposure to sunlight or ultraviolet lamps was widely promoted as a form of preventive medicine. Home sunlamps gained popularity and were aggressively marketed to the public. A suntan, which had previously achieved limited popularity, now was viewed as *de rigueur* in the United States and Europe. The role that medical advocacy of ultraviolet light exposure played in initially advancing the practice of sunbathing is not commonly appreciated today. Ironically, public health recommendations of the time were often diametrically opposed to those being made at present, since sunlight exposure is currently recognized as the major preventable cause of cancer of the skin. (J Am Acad Dermatol 2003;48: 909-18.)

### ULTRAVIOLET LIGHT, VITAMIN D AND RICKETS

The origin of rickets, a disease marked by abnormal ossification and now known to be caused by vitamin D deficiency, remained uncertain at the start of the 20th century. One school of thought was that it was the result of a dietary deficiency, and there had been advocates of cod liver oil (later recognized to be a rich source of vitamin D) for the disease since the 19th century.<sup>1</sup> Because it was more common in urban children, another theory was that it was related to "hygiene," which might include a lack of sunlight or "fresh air."<sup>2,3</sup> In 1919, controlled animal studies indicated that either cod liver oil<sup>4</sup> or ultraviolet light from a mercury vapor quartz lamp<sup>5</sup> could prevent or treat rickets. The fact that both ultraviolet light and a dietary factor could have very similar effects on the disease was difficult to reconcile.<sup>6</sup> The antirachitic factor in cod liver oil was shown not to be vitamin A, as was initially suspected, but an unidentified fourth vitamin, which was termed vitamin D.<sup>7</sup> In 1923, Alfred Hess and Mildred Wein-

stock<sup>8</sup> narrowed down the critical wavelengths of ultraviolet light needed to prevent rickets to the range of less than 313 nm. The following year, a major advance in understanding the mechanism of action of ultraviolet light in rickets was made when Hess and Weinstock,<sup>9</sup> as well as Steenbock and Black,<sup>10</sup> independently determined in animal studies that ultraviolet irradiation of otherwise inactive food rations was as effective as direct irradiation for the treatment of rickets. This led to the hypothesis that vitamin D—still unidentified but correctly thought to be a sterol—was formed in the skin when it was subjected to ultraviolet radiation.<sup>11,12</sup>

Rickets in children was not uncommon in the early 20th century, and as new insights were gained into its etiology, efforts were undertaken to better prevent and treat this condition. Dietary sources of vitamin D and ultraviolet light were both used, and there was discussion in the medical literature on the relative merits of these therapies.<sup>13</sup> The use of ultraviolet light in rickets was problematic. Rickets was most prevalent in temperate climates during the winter months. Thus, sunlight exposure was considered unreliable for those most at risk.<sup>14</sup> This led to use of ultraviolet lamps, which proved potentially hazardous, impractical, and expensive as a preventive measure.<sup>15</sup>

In contrast, dietary supplementation of vitamin D was a relatively easy means of preventing and treating rickets. Cod liver oil remained popular and was

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avored by some physicians because it also had a high vitamin A content.<sup>13,16,17</sup> The availability of vitamin D–fortified products grew dramatically during the 1920s. Ultraviolet irradiation could enrich the vitamin D content of many foods, and this was accomplished in various oils, fats, cereal products, meats, and milk.<sup>18</sup> Irradiated ergosterol was discovered to be a potent source of vitamin D (calciferol or vitamin D<sub>2</sub>) and was marketed under the name viosterol.<sup>16,19</sup> Irradiated ergosterol could be taken as a supplement or used by manufacturers for fortifying other foods, such as milk. Dietary supplementation of vitamin D would have profound public health effects on the incidence of rickets caused by vitamin D deficiency in children in the United States and other industrialized countries.<sup>20,21</sup>

Despite the advantages of dietary supplementation, advocacy of ultraviolet light treatment to prevent and treat rickets remained strong in the 1920s. This was in large part due to other health benefits ascribed to ultraviolet light exposure (see below). A report by England's Medical Research Council in 1929 was critical of the widespread use of phototherapy for rickets.<sup>22–24</sup> The report and accompanying editorials noted that whereas phototherapy cost 50 times more than treatment with cod liver oil, and "heavy expenditure was soon incurred in the provision of lamp treatment in many schools and institutions,"<sup>24</sup> there was "no scientific reason to suppose that the supply of vitamin D to the body for the treatment of rickets, or any other purpose, is better effected by ultra-violet rays falling on the skin than by the direct provision of the necessary food values."<sup>22</sup>

### MYRIAD MEDICAL CLAIMS FOR ULTRAVIOLET LIGHT

Before the 1920s, exposure to ultraviolet radiation was already viewed as salutary by the medical profession, based on the long-standing attribution of "tonic" properties to sunlight and the emergence of modern phototherapy (see Part 1). The discovery that sunlight could prevent or treat rickets was viewed by many in medicine at the time as a resounding confirmation of the belief that ultraviolet light was beneficial to health. Attitudes were reflected in editorials at the time. In 1924, the *Journal of the American Medical Association (JAMA)* published an editorial asking: "Shall it not soon be said in truth that both animals and plants literally can bottle up sunshine for us—as we ourselves may do in helpful measure if only we deign to permit the beneficent rays to find a way without artificial hindrance to our bodies?"<sup>25</sup> The following year, the author of another *JAMA* editorial remarked: "The

antirachitic effects of exposure to sunlight discovered during the last few years indicate the therapeutic and prophylactic efficacy of sunlit air."<sup>26</sup>

On the heels of the discovery that ultraviolet light played a role in vitamin D synthesis, numerous other medical benefits were soon attributed to ultraviolet radiation. One prevalent fallacy was that exposure to ultraviolet light increased resistance to infections including the "common cold." This idea gained acceptance after a 1924 report that blood taken from ultraviolet-irradiated rabbits showed an increased "bactericidal power" in an in vitro assay.<sup>27,28</sup> However, controlled studies in human subjects indicated that ultraviolet light treatment did not result in a decreased incidence of respiratory infections.<sup>22,29–31</sup> Nonetheless, increased resistance to infections would continue to be touted as a benefit of ultraviolet radiation by enthusiasts, including marketers of commercial sunlamps. Another oft-cited benefit, unsupported by convincing scientific evidence, was the claim of physiologic effects such as "improved metabolism."<sup>32</sup> Other common claims were that ultraviolet radiation improved "tissue tone" and "skin tone," acted as a general tonic, increased mental activity, improved the circulation, and cured anemia.<sup>33</sup> The last claim, suggested by the results of initial studies that were not reproducible, led to a *JAMA* editorial in 1928 that cautioned physicians: "The enthusiasms that have been aroused by the demonstrable physiologic potency of irradiation with ultraviolet rays generated in various ways call for restraint before they are permitted to promote therapeutic procedures that may presently be discovered to be ill advised. . . . The persisting uncertainty [over the effect of ultraviolet radiation in anemia] should act as a warning against undue ventures that may actually border on quackery, until further explicit knowledge is available."<sup>34</sup>

Concern about exaggerated medical claims for ultraviolet light treatment was well founded. The use of phototherapy grew rapidly and although the above claims were made most frequently, ultraviolet light was purported to be an effective treatment for a host of medical conditions. In his 1937 textbook on phototherapy, Frank Krusen, the physician who headed the Section on Physical Therapy at the Mayo Clinic, listed 176 nondermatologic and 73 dermatologic diseases "in which ultraviolet light has been said to be of value."<sup>35</sup> Diseases listed covered a broad area of medicine, including such diverse conditions as pneumonia, chorea, cirrhosis of the liver, chronic constipation, both hypertension and hypotension, nephritis, "heart disease," and eclampsia. The catalogue of diseases reflects the almost panacea-like manner in which ultraviolet light therapy

*Alphabetical List of Diseases*

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Acne conglobata—acne cachecticorum, A, B  
 Acne varioliformis, C  
 Acne vulgaris, A, C  
 Adenoma sebaceum, D  
 Alopecia areata, C, D  
 Alopecia praematura, C  
 Angioma serpiginosum, C  
 Cicatrix—pitted scars, D  
 Dermatitis herpetiformis, A, B, C  
 Dermatophytid, B  
 Dermatophytosis, B  
 Eczema—various types, B  
 Erysipelas, B, C  
 Erythema induratum, A, B, C  
 Folliculitis—pustular, A  
 Furunculosis, A, D  
 Herpes zoster, B  
 Leukoderma, C  
 Livido reticularis, B  
 Lupus erythematosus, A, B, D  
 Lupus vulgaris, A, D  
 Neurodermatitis—circumscribed, C, D  
 Neurodermatitis—disseminate, A, B  
 Nevus flammeus (port-wine mark), D  
 Parapsoriasis, C  
 Pernio, B  
 Pityriasis rosea, C  
 Pruritus—secondary, A, B, C  
 Psoriasis, A, D  
 Scleroderma, A, B  
 Scrofuloderma, A  
 Sycosis vulgaris, A, B, C  
 Telangiectasia (x-ray and radium sequelae), D  
 Ulcers and wounds—indolent, B, C, C

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The letters in the list signify the routine technic in general use by American dermatologists:

A. Frequent general irradiation of the entire body or of large areas of normal skin with doses too small to evoke erythema, for the purpose of influencing the disease through possible systemic action of the radiation.

B. Frequent irradiation of generalized or fairly extensive eruptions with small or at least suberythema doses.

C. Irradiation of fairly extensive eruptions with erythema doses. There may be but a single treatment, or treatments may be given once or twice a week or even daily, depending on the results desired and obtained, toleration, and the like.

D. Irradiation of circumscribed eruptions or lesions with erythema and blistering doses. Treatments are not repeated until all evidence of reaction has disappeared.

**Fig 1.** Table of cutaneous diseases treated by ultraviolet irradiation. (From Mackee GM. Ultraviolet therapy in dermatology. JAMA 1932;98:1553-6. Copyrighted 1932, American Medical Association.)

was viewed by some advocates. A 1933 medical textbook entitled *Actinotherapy Technique*, with a foreword by the eminent British physician and phototherapist, Sir Henry Gauvin, was published by the Hanovia company, which manufactured ultraviolet lamps.<sup>36</sup> The textbook promoted ultraviolet light therapy for conditions such as diabetes, gastric and duodenal ulcers, obesity, and arteriosclerosis. In angina pectoris, for example, readers were advised that patients treated with ultraviolet light were able to “dispense with nitro-glycerine.”<sup>37</sup>

The clinical uses of phototherapy were the focus of so much attention that an author of a 1938 review was almost apologetic: “To write another article on the subject of ultraviolet therapy would seem, at first sight, to be quite inexcusable. There are few subjects on which more papers have been published, few subjects more ably covered in articles of review, and, one might add, no subject more capable of reducing to utter despair an author faced with the necessity of saying something new.”<sup>38</sup> Although phototherapy had become an independent field within physical therapy, it continued to be used by dermatologists for the treatment of skin disorders. In a 1932 review, the dermatologist George MacKee listed cutaneous diseases for which phototherapy was commonly employed (Fig 1).<sup>39</sup>

## ULTRAVIOLET LIGHT EXPOSURE AS A PUBLIC HEALTH GOAL

Preventive medicine was a rapidly developing discipline in the 1920s.<sup>40</sup> Despite occasional criti-

cism of the prophylactic use of ultraviolet radiation (such as the report issued by England’s Medical Research Council in 1929), exposure to ultraviolet light was viewed by many within the medical and public health communities as an important form of preventive medicine. Based on its numerous purported benefits, increasing ultraviolet light exposure in both children and adults became a public health goal. Advocacy of sunbathing was voiced in the medical literature. An article in *The Lancet* referred to sunbathing as “one of Nature’s greatest aids to maintaining and acquiring proper health.”<sup>41</sup> Another report on sunbathing in the *Journal of State Medicine* indicated: “It has not only a beneficial effect on the general physique and on the general power of resistance to disease but . . . there is a stimulating effect upon the mentality of patients receiving insolation.”<sup>42</sup>

Articles appeared in the popular press with titles such as, “Meet Doctor Sunshine,”<sup>43</sup> “Eating Sunshine,”<sup>44</sup> and “Nature Gives Us Sunlight—Let’s Use It!”<sup>45</sup> Readers were instructed on the benefits of sunlight: “Sunshine is good medicine. . . . It would be hard to find a simpler one, as cheap and easy to take. The more we learn about our sun the more wonderful it becomes.”<sup>46</sup> A public health advertisement entitled “Doctor Sun” declared: “Sunlight is the finest tonic and health-builder in the world. It works its cures, mysteriously, through the skin. In sunshine there is a wonderful healing power—the ultra-violet rays.”<sup>47</sup> Among the many benefits listed for sunlight



**Fig 2.** A classroom at Rollier's "school in the sun." Students received sun exposure as a form of preventive medicine while attending school. (From Rollier A. *Heliotherapy: with special consideration of surgical tuberculosis*. Copyrighted 1927. Reprinted by permission of Oxford University Press.)

exposure was its supposed healthful effect on normal skin: "Contact of the sun's rays with the skin causes the skin capillaries to expand and hence provides the skin with a more generous supply of blood and nourishment. Let the sun help you nourish your skin."<sup>45</sup> To further sunlight's appeal, authors emphasized that it was a "natural" remedy, and mention was frequently made of the fact that sunlight had been used medicinally by "the ancients" in Egypt, Greece, and Rome. Although advocates of ultraviolet light exposure generally noted the risks of overexposure such as sunburn and sunstroke, concerns about the carcinogenicity of ultraviolet light were virtually never raised at this time. Clinical observations had already implicated long-term sun exposure as a cause of cutaneous malignancy, although the association was poorly understood and received little attention from the medical profession (see Part 1).<sup>48</sup>

Public health advocates tried to provide specific advice to the public on ways to increase ultraviolet light exposure. One recommendation was to wear types of clothing that allowed greater penetration of ultraviolet light: "Porous, thin and loosely woven clothing presents to us a better chance for the appropriation of [ultraviolet] rays."<sup>49</sup> A director at the National Institute for Medical Research in England declared that "many people wore too much clothing," and he "commended the wearing of stockings of [artificial silk] and of low-necked dresses."<sup>50</sup> "Sun

suits" became fashionable for children.<sup>51</sup> Recommendations were made for schools: "[Ultraviolet] lamps should be in our schools, where the children, attired in loin cloths, should have musical drills and dance round the lamp of artificial sunlight."<sup>52</sup> The editors of *The Lancet* were even rethinking their views on the practice of nudism; commenting on a petition to set aside public land for this purpose, an editorial stated: "On first consideration, the idea of a community of people deliberately practising nudity, especially with municipal encouragement, strikes the average person as somewhat ridiculous. . . But the discovery that the rays of the sun on the skin exert a beneficent effect on health has done something to undermine these prejudices."<sup>53</sup>

The importance of direct sunlight exposure was emphasized. Children were urged to "keep at the sunny side of the road and never to walk on the shady side."<sup>54</sup> Outdoor sunbaths were recommended for infants.<sup>55,56</sup> Articles cautioned that ordinary window glass blocked ultraviolet rays.<sup>49,57-59</sup> Glass was developed that more efficiently transmitted ultraviolet radiation.<sup>58-62</sup> A well-known brand, Vitaglass, transmitted 65% of ultraviolet rays at 320 nm and 25% at 290 nm.<sup>63</sup> Such glass windows became popular and were utilized by schools, hospitals, and hotels.<sup>49,64</sup> A less expensive alternative was wire netting impregnated with a translucent cellulose.<sup>59</sup>

More extensive public health efforts were under-



**Fig 3.** *Punch* cartoon from 1934. (Illustration. *Punch* 1934;186 [summer number]. Reproduced with permission of Punch Ltd.)

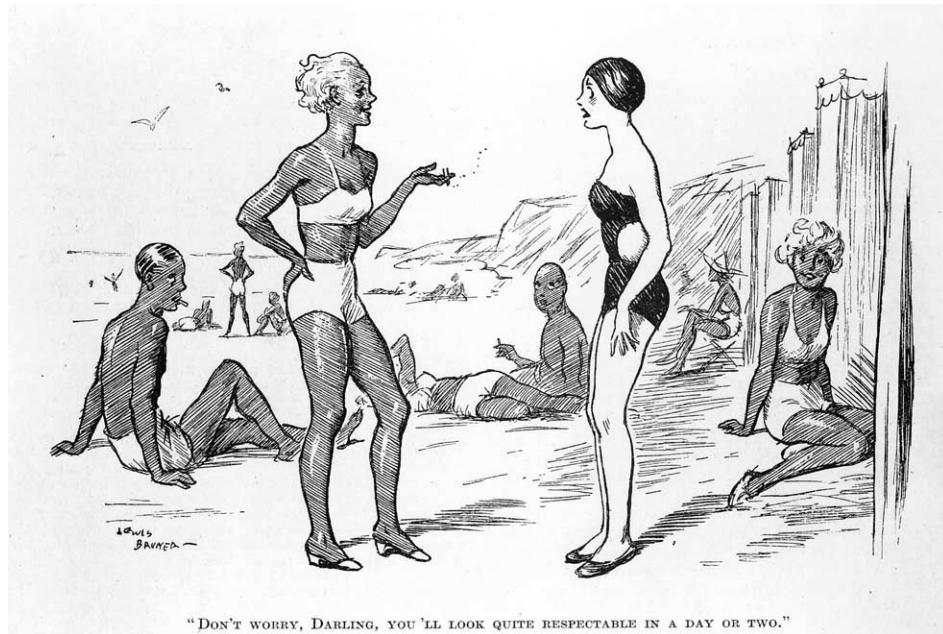
taken to promote ultraviolet light exposure. A public health program instituted in New Haven, Connecticut, instructed mothers on administering sunbaths to newborns to prevent rickets.<sup>65</sup> Nurses visited homes to demonstrate the sunbaths, which were recommended to begin with exposure to the hands and face 10 to 15 minutes daily, and to increase 2 to 3 minutes daily until the newborn's entire body was exposed for 1 hour twice daily. Auguste Rollier, a Swiss physician and early champion of prophylactic heliotherapy, operated a "school in the sun," under the theory that sunlight prevented tuberculosis in children (Fig 2).<sup>66</sup> In Cambridge, Massachusetts, a summer camp was established to treat undernourished children with sunbathing.<sup>67</sup> The goals of the 8-week program reflected perceived benefits: to promote weight gain as well as improve muscle tone, hemoglobin count, and the excretory function of the skin. A sun bathing center for children was established in a public park in London.<sup>68</sup> Efforts were also undertaken by private institutions; in 1930, Cornell University claimed to be the first American university to install an ultraviolet lamp solarium,

"to make available, artificially, the beneficial effects of the sun's rays to students . . . ."<sup>69</sup>

### SUNBATHING

The popularity of recreational sunbathing exploded in the late 1920s (Figs 3 and 4).<sup>70,71</sup> Described in an article at the time as "ultra-violet insanity,"<sup>72</sup> the beaches became "public rotisseries" cluttered with 'oiled bodies roasting to a turn.'<sup>73</sup> Public health advocacy for ultraviolet exposure undoubtedly served as an impetus for this popularity, although other factors were also at play. Sunbathing already had achieved a limited popularity in the early century, so medical and social forces were both driving its popularity: "For once the lords of fashion and learning agree, for doctors hail the present sun-tan fad as healthful. . . ."<sup>74</sup> A writer for the *New York Times Magazine* in 1929 mused on the causes of sunbathing's dramatic rise in popularity:

"It is a nice question as to what forces picked up the idea and spread a sudden desire for sunshine and its visible effects over the entire population. Idealists would like to believe that the people, investigating



**Fig 4.** *Punch* cartoon from 1936. (Illustration. *Punch* 1936;190:266. Reproduced with permission of Punch Ltd.)

the medical doctrine and accepting it as sober fact, went deliberately forth to get what was good for them, and took to sun baths with an avidity they had never shown for spinach, sleep or orthopedic shoes. Observers of feminism link it up with the whole trend toward sports for women, freedom of movement and the casting off of hampering clothes. Cynics say dryly that it was the force of commerce concentrating on a new fad and using medical phrases as a camouflage to sell expensive equipment and new sets of clothes. Moralists, less concerned with causes than with conditions, murmur portentous things about 'irresponsible tendencies toward exhibitionism,' and the public dangers of 'exposure to the point of indecency.'<sup>75</sup>

Although medical proponents of sunbathing recommended increasing the time of sun exposure incrementally, techniques advised in the popular press were sometimes less subtle: "[T]he ideal way to insure a good, lasting sunburn is to recline for hours on some beach clad in as scanty a bathing suit as modesty and the law will permit. A liberal coating of coconut oil or some kindred unguent will hasten the process and protect the skin from blisters and peeling."<sup>76</sup> Attention was given to suntanning as a fashion, even with respect to the desired darkness of the tan. Debutantes were interviewed about suntanning in a 1933 article in *Collier's*; one girl contended, "it's handsome to be very brown with a light evening gown," while another advised, "that dark tan is simply ghastly—the thing to do is to turn a gleaming gold."<sup>72</sup> With sunbathing's rise in popularity, entre-

preneurs offered alternative places to the beach or city parks, to lie out in the sun. Sunbathing became available atop hotels and even on certain trains, which installed ultraviolet light-transmitting glass windows.<sup>41,77</sup> Roof sunbathing resorts opened up in Manhattan, some of which were combined with penthouse speakeasies.<sup>78</sup>

Both the fashion and cosmetic industries capitalized on the growth of sunbathing. Bathing suits, already less modest by World War I, now offered even less protection; two-piece fashions were introduced for women in the 1930s, whereas men's bathing suits were reduced to just shorts. Clothes, too, were fashioned to accommodate suntanning, such as by incorporating a square "suntan neckline." Sunbathing's popularity was reflected in advertising for cosmetic preparations, which claimed to improve a suntan. A 1929 advertisement for Pond's declared: "Now everyone, everywhere, by lake and sea, in mountains and in country, is seeking her place in the sun, toasting her skin to a delightful brown."<sup>79</sup> Special face powders were marketed that gave the appearance of sun exposure, although a *New York Times* writer found them to be a poor substitute: "Even the new sunburn and sun-tan, the tints now sought at beauty counters, cannot compete with the healthy skin burnished by wind, salt air, and sun."<sup>80</sup>

The view of a suntan as a sign of health became so pervasive in the late 1920s that advertisements for many food products seized on the analogy of sunbathing in their marketing. For example, an adver-





**ULTRAVIOLET**  
helps you  
keep  
*Fit*

*The benefit of  
hours of sun treatment... at  
home... in as many minutes.*

**HEALTH-GIVING**, healing rays of light... the vital, invisible element of sunshine that all humans crave... this is Ultraviolet.

For years it has been used by physicians in combating weakness and disease. Today the acceptance of its importance as a general health aid grows increasingly with an appreciation of the deficiencies of our light-starved lives.

The unseen Ultraviolet rays possess properties which exert a deep metabolic effect upon all the tissues of the entire body. Properly employed under the direction of a physician, they have been found to help in the correction of nutritional deficiencies, the building up of resistance to disease and, in general, the repairing of the ravages of a workaday existence. They have been found to act as a sedative, a tonic, and as a healing agent in conditions of infection or inflammation.

Production of these rays in highly efficient intensity... for use in the doctor's office, hospital or home... was first made practical by the original *Alpine Sun Lamp*. This scientific appliance, with twenty years improvement and refinement, is now brought within the means of the ultimate beneficiary through the *Lixor* model for home use.

Every business man, every indoor worker, every parent, should know all the facts about Ultraviolet and the *Alpine Sun Lamp*. They should know the possibilities for maintaining robust health... sun-tanned bodies... for securing the benefits of hours in the clear Alpine sunlight through brief minutes of treatment in the privacy of the home.

Fig 5. 1928 advertisement for the Hanovia Alpine Sun Lamp.

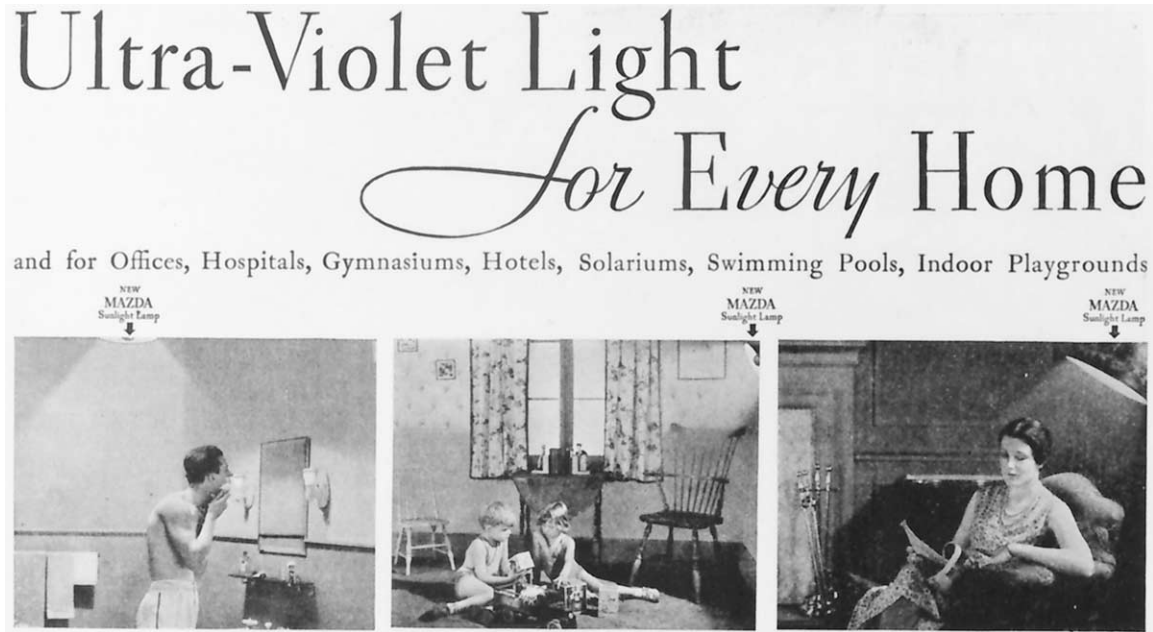
tisement for Wheatena cereal stated: "Beautiful sun-browned bodies! Delicious sun-browned Wheatena! What pictures of health! The same *natural* rays of the sun that brown your skin—that pour health into your body—also give Wheatena its color and its wholesomeness."<sup>81</sup> An advertisement for the chocolate drink Cocomalt proclaimed: "Modern science has given new significance to a good coat of tan. For sunshine means health and vigor. . .Cocomalt contains Vitamin D. . .the sunlight vitamin."<sup>82</sup>

### ULTRAVIOLET LAMPS

As phototherapy and sunbathing gained popularity, the commercial manufacture of ultraviolet lamps became a booming industry. Among the companies marketing ultraviolet lamps to physicians and consumers were General Electric, Hanovia, New Century, Health Ray, Science Laboratories, Ultra-violet Ray Laboratories, Eveready, Westinghouse, Rose, and Burdick. The two principal artificial light sources for phototherapy were the carbon arc and

the quartz mercury vapor arc. The radiation spectrum of carbon arc lamps could be further enriched for the short ultraviolet wavelengths by impregnating the carbon core with iron, tungsten, titanium or nickel<sup>63,83</sup> Carbon arc lamps were so commonly used that instructions on constructing a simple one were provided in a *New England Journal of Medicine* article in 1930.<sup>84</sup> The popular quartz mercury vapor lamps included the water-cooled (Kromayer), air-cooled, and "cold quartz" varieties.<sup>85-87</sup> Other ultraviolet lights in clinical use included the nickel and tungsten arc, and the iron and magnetite arc.<sup>63,85</sup> Infrared lamps (essentially heating lamps) were also marketed and advertised for various medical conditions such as "rheumatism."<sup>88</sup>

It was possible to remove ultraviolet emission below 280 nm with glass filters, although unfiltered lamps were commonly employed by physicians and were available for home use with a physician's prescription.<sup>89</sup> Because of the ocular dangers of short-



**Fig 6.** 1932 advertisement for the General Electric (Mazda) S-2 ultraviolet light.

wave radiation, it was imperative that protective goggles be worn,<sup>90</sup> a fact that was not always adequately addressed in consumer instructions for sunlamps.<sup>91</sup> The American Medical Association in the 1930s established recommendations for ultraviolet lamps which stipulated that those marketed for home use should not emit appreciable ultraviolet radiation of wavelengths shorter than 280 nm,<sup>92</sup> but such guidelines were not necessarily followed by manufacturers.<sup>93-96</sup>

Aggressive advertising campaigns for ultraviolet lamps were run in popular magazines. Hanovia ran such a campaign in the late 1920s for its Alpine Sun Lamp (Fig 5),<sup>97</sup> a light source with ultraviolet emission peaks at 254, 313, and 365 nm.<sup>36</sup> The company indicated that a severe sunburn (described to physicians as “regenerative erythema” or “inflammatory stimulus”) was acquired in approximately 6 minutes at a distance of 30 inches.<sup>36</sup> Like most home sunlamps, it was marketed primarily as a means of preventive medicine; an advertisement stated: “[L]ie back in comfort while the rays of health steal through your skin, enriching your blood, touching frayed nerves with a healing, soothing gentleness, reaching in to stir vital glands into normal, healthful activity, increasing your power of assimilation, killing harmful bacteria that may be on your skin or in your blood, increasing your resistance to disease, flooding your whole body with energy and well-being.”<sup>98</sup>

In the early 1930s, the lighting giant General Electric made a concerted foray into the ultraviolet light

market. General Electric had developed a tungsten-mercury vapor arc bulb (called type S-1), emitting both visible and ultraviolet light. A Corex D glass globe filtered wavelengths less than 280 nm, so protective goggles were considered unnecessary. The company marketed this ultraviolet lamp for use in everyday settings, much like ordinary incandescent light bulbs. Their advertising campaign promulgated the concept of “dual purpose lighting,” in which a single lamp supposedly both furnished illumination and promoted health (Fig 6).<sup>98</sup> The lamp was described as being “50 times as effective in producing tanning of the skin, known medically as erythema, as midday midsummer sunlight of equal intensity.”<sup>99</sup> The company also marketed a “milder” S-2 type bulb, which at a distance of 24 inches, elicited a “mild sunburn” in approximately 20 minutes.<sup>100</sup>

Like other manufacturers of ultraviolet lamps, General Electric capitalized on medical advocacy of ultraviolet exposure in its advertising: “Bask in health-protecting ultra-violet rays while you read, play bridge, or bathe. Give children ultra-violet radiation in their playrooms.”<sup>101</sup> A variety of fixtures were sold so that the lamps could be placed on ceilings or walls, or used as portable desk and floor lamps. The director of General Electric’s Lighting Research Laboratory, the prominent engineer Matthew Luckiesh made a point of condemning quackery associated with ultraviolet light “. . . by charlatans or others who profit blandly or blindly in the twilight zone of knowledge.”<sup>102</sup> At the same time, he fanned



public excitement about the benefits of ultraviolet exposure:

"In the future. . . we shall sleep in beds shaped as covered wagons, and instead of pajamas we shall have ultra-violet light rays pouring down on us as we sleep, producing the effect of reposing on a sunlit meadow in a tropical land. The benefit to our health should be incalculable."<sup>103</sup>

Luckiesh predicted that a "new world era" would be ushered in by General Electric's new ultraviolet light bulbs, which he believed would, among other things, extend the human life span: "Is it not easy to suspect that [ultraviolet light's] benefits extend far beyond present knowledge and even far beyond the ability of our imagination to encompass at the present time?"<sup>102</sup>

## CONCLUSION

The 1920s saw a dramatic rise in the advocacy of ultraviolet exposure both as a perceived prophylactic measure and in phototherapy. Such medical opinions played a significant role in the public's embrace of recreational sunbathing and were exploited commercially by manufacturers of ultraviolet lamps. As the decade came to a close, therefore, the medical profession was forced to come to terms with these consequences. Increasingly in the 1930s and 1940s, concerns would be expressed over the dangers of excessive exposure to ultraviolet light. Importantly, evidence of the carcinogenicity of ultraviolet light would finally begin to receive attention after reports of the experimental induction of skin tumors in rodents exposed to ultraviolet lamps or sunlight.

## REFERENCES

- Guy RA. The history of cod liver oil as a remedy. *Am J Dis Child* 1923;26:112-6.
- Palm TA. The geographic distribution and aetiology of rickets. *Practitioner* 1890;45:270-9, 321-42.
- Haynes RC. Agents affecting calcification: calcium, parathyroid hormone, calcitonin, vitamin D, and other compounds. In: Gilman AG, Rall TW, Nies AS, Taylor P, editors. *Goodman and Gilman's the pharmacological basis of therapeutics*. 8th ed. New York: Pergamon Press; 1990. p. 1496-522.
- Mellanby E. An experimental investigation on rickets. *Lancet* 1919;1:407-12.
- Huldschinsky K. Heilung von Rachitis durch Kunstliche Hohen-sonne. *Dtsch Med Wochenschr* 1919;14:712-3.
- The physiologic and therapeutic action of light [editorial]. *JAMA* 1922;78:1391-2.
- McCollum EV, Simmonds N, Becker JE, Shipley PG. Studies on experimental rickets. XXI. An experimental demonstration of the existence of a vitamin which promotes calcium deposition. *J Biol Chem* 1922;53:293-312.
- Hess AF, Weinstock M. A study of light waves in their relation to rickets. *JAMA* 1923;80:687-90.
- Hess AF, Weinstock M. Antirachitic properties imparted to inert fluids and to green vegetables by ultra-violet irradiation. *J Biol Chem* 1924;62:301-13.
- Steenbock H, Black A. Fat-soluble vitamins. XVII. The induction of growth-promoting and calcifying properties in a ration by exposure to ultra-violet light. *J Biol Chem* 1924;61:405-22.
- Hess AF, Weinstock M, Helman DF. The antirachitic value of irradiated phytosterol and cholesterol. *J Biol Chem* 1925;63:305-8.
- Genesis of vitamin D in the body by ultraviolet irradiation [editorial]. *JAMA* 1931;97:392-3.
- Some aspects of vitamins and radiant energy [editorial]. *JAMA* 1923;80:1695-6.
- Hess AF. The ultraviolet rays of the sun. *JAMA* 1925;84:1033-7.
- The dangers of ultraviolet rays [editorial]. *JAMA* 1928;90:120-1.
- Cod liver oil, viosterol or sunlight for rickets [query to the editor]. *JAMA* 1930;94:283.
- Park EA. The therapy of rickets. *JAMA* 1940;115:370-9.
- Blunt K, Cowan R. Irradiated foods and irradiated ergosterol. *JAMA* 1929;93:1301-8.
- Viosterol or irradiation [query to the editor]. *JAMA* 1930;94:580.
- Harrison HE. The disappearance of rickets. *Am J Public Health* 1966;56:734-7.
- Holick MF. McCollum Award Lecture, 1994: vitamin D—new horizons for the 21st century. *Am J Clin Nutr* 1994;60:619-30.
- Medical Research Council: annual report for 1927-8. *Lancet* 1929;1:628-31.
- Sun-worship [editorial]. *Lancet* 1929;1:615-6.
- Severe criticism of treatment by ultraviolet radiation [foreign letters]. *JAMA* 1929;92:1364-5.
- Bottled sunshine [editorial]. *JAMA* 1924;83:1250.
- Sunshine and health [editorial]. *JAMA* 1925;85:1972.
- Colebrook L, Eidinow A, Hill L. The effect of radiation on the bactericidal power of the blood. *Br J Exp Pathol* 1924;5:54-64.
- Sunlight and heliotherapy [editorial]. *JAMA* 1925;84:1498-9.
- Barenberg LH, Friedman I, Green D. The effect of ultraviolet irradiation on the health of a group of infants. *JAMA* 1926;87:1114-7.
- Barenberg LH, Lewis JM. The effect of carbon arc irradiation on the health of a group of infants. *JAMA* 1928;90:504-6.
- Doull JA, Hardy M, Clark JH, Herman NB. The effect of irradiation with ultra-violet light on the frequency of attacks of upper respiratory disease (common colds). *Am J Hyg* 1931;13:460-77.
- Ultraviolet radiation and basal metabolism [editorial]. *JAMA* 1927;89:1152.
- Regulations to govern advertising of ultraviolet generators to the public only. *JAMA* 1932;98:400-1.
- Irradiation and the blood [editorial]. *JAMA* 1928;91:1038.
- Krusen FH. *Light therapy*. 2nd ed. New York: Paul B. Hoeber Inc; 1937.
- Actinotherapy technique. Slough: Sollux Publishing Company; 1933.
- Actinotherapy technique. Slough: Sollux Publishing Company; 1933. p. 61.
- Luce-Clausen EM. Clinical aspects of ultraviolet therapy. *JAMA* 1938;111:311-6.
- MacKee GM. Ultraviolet therapy in dermatology. *JAMA* 1932;98:1553-61.
- Draper WF. The unexplored field of preventive medicine in private practice. *JAMA* 1927;89:491-3.
- Worthington GV. Sun-bathing in upper Egypt. *Lancet* 1926;2:988.
- Gauvain H. Sun treatment in England. *J State Med* 1930;38:468-75.
- Harrow B. Meet doctor sunshine. *Hygeia* 1927;5:579-82.
- Baker SJ. Eating sunshine. *Ladies Home Journal* 1930;44:127, 130.

45. Eddy WH. Nature gives us sunlight—let's use it. *Good Housekeeping* 1938;107:51, 140.
46. Sunshine as a medicine. *Literary Digest* 1924;80:69-70.
47. Doctor sun [Metropolitan Life Insurance Company advertisement]. *Literary Digest* 1928;97:53.
48. Albert MR, Ostheimer KG. The evolution of current medical and popular attitudes toward ultraviolet light exposure: Part 1. *J Am Acad Dermatol* 2002;47:930-7.
49. Levine VE. Sunlight and its many values. *Sci Mon* 1929;29:551-7.
50. Sunshine and open air and health [foreign letters]. *JAMA* 1928;90:396.
51. Sunshine and clothing [editorial]. *JAMA* 1929;93:461-2.
52. Artificial-light therapy [foreign letters]. *JAMA* 1925;84:687-8.
53. Naked and unashamed [editorial]. *Lancet* 1932;1:688.
54. Sun baths for school children [foreign letters]. *JAMA* 1924;82:1794.
55. Kenyon JH. The sun bath. *Good Housekeeping* 1925;80:94.
56. Baker SJ. Sun baths for the youngest generation. *Ladies Home Journal* 1928;45:198, 201.
57. Parsons FW. Sun worship. *Saturday Evening Post* 1929;202:28-9, 211-4.
58. Eddy WH. Sunlight: bottled, preserved and plain. *Good Housekeeping* 1928;87:102, 162-6.
59. Eddy WH. The light that comes into your house. *Good Housekeeping* 1931;92:99-100, 160.
60. The sunlight of health enters through Quartz-Lite Glass [American Window Glass Company advertisement]. *Literary Digest* 1927;95:61.
61. Caldwell GW, Dennett RH. The clinical value of sunlight through ultraviolet transmitting glass. *JAMA* 1929;92:2088-90.
62. Coblenz WW. Ultraviolet transmitting glasses: specification of minimum transmission. *JAMA* 1930;95:864-5.
63. Mayer E. The fundamentals and the clinical aspects of light treatment: with especial relation to tuberculosis. *JAMA* 1927;89:361-7.
64. The use of ultraviolet rays in the schools [foreign letters]. *JAMA* 1927;89:1264.
65. Eliot MM. The control of rickets: preliminary discussion of the demonstration in New Haven. *JAMA* 1925;85:656-63.
66. Rollier A. *Heliotherapy: with special consideration of surgical tuberculosis*. 2nd ed. London: Oxford University Press; 1927.
67. Day HF. Sunshine camp in Cambridge. *Hygeia* 1927;5:248-51.
68. Sun-bathing in a London Park [editorial]. *Lancet* 1930;2:1409-10.
69. Ultraviolet solarium installed at Cornell [medical news]. *JAMA* 1930;94:725.
70. *Punch* [illustration] 1934;186 [summer number].
71. *Punch* [illustration] 1936;190:266.
72. Seinfel R. The burning question. *Colliers* 1933;92:24, 35.
73. Beauty and sunburn. *New York Times* 1931 Aug 15;col 6:12.
74. Free EE. Tan fad to furnish new facts to science. *New York Times* 1929 Aug 11;Sect. 20, col 1:3, 10.
75. Adams M. Modern worshipers of that old God, the sun. *New York Times Magazine* 1929 Jul 7:12-3.
76. Ways to get a stylish tan. *New York Times Magazine* 1929 Jun 23:19.
77. Sun-bathing in trains [foreign letters]. *JAMA* 1929;93:1821.
78. Sun-bathers seek Manhattan roofs. *New York Times* 1932 Jul 10;Sect. 10, col 2:1.
79. Secrets of a smart sun-tan [Pond's Extract Company advertisement]. *Ladies Home Journal* 1929;46:31.
80. All shades of tan are now seen on New York's streets. *New York Times* 1928 Aug 19;Sect. 7, col 2:9.
81. Sun-browned [Wheatena Corporation advertisement]. *Ladies Home Journal* 1929;46:120.
82. Of course, you're taking the children to the beach this summer [R.B. Davis Company advertisement]. *Ladies Home Journal* 1929;46:40.
83. Mayer E. The present status of light therapy: scientific and practical aspects. *JAMA* 1932;98:221-30.
84. Peck EC. A simple therapeutic arc. *N Engl J Med* 1930;202:529-30.
85. Coblenz WW. Sources of ultraviolet radiation and their physical characteristics. *JAMA* 1929;92:1834-7.
86. Coblenz WW. Sources of radiation and their physical characteristics: cold red ray and cold ultraviolet ray lamps. *JAMA* 1931;97:1965-7.
87. Coblenz WW. Sources of ultraviolet and infra-red radiation used in therapy: physical characteristics. *JAMA* 1934;103:254-7.
88. Coblenz WW. Sources of ultraviolet and infra-red radiation used in therapy: physical characteristics. *JAMA* 1934;103:183-8.
89. This advertisement should send men and women by the thousands into physicians' offices [Hanovia Chemical and Manufacturing Company advertisement]. *Literary Digest* 1928;97:51.
90. Light in the treatment of disease [editorial]. *N Engl J Med* 1930;8:391-2.
91. Palm Beach Mercury Arc "Cold" Ultraviolet Ray Sun Lamp not acceptable. *JAMA* 1938;110:1673.
92. Acceptance of sunlamps. *JAMA* 1933;100:1863-4.
93. Hanovia Home Model Alpine Sunlamp (models S-309 and E-302) not acceptable. *JAMA* 1937;108:1798.
94. Health Ray Twin Carbon Arc Sunlamp not acceptable. *JAMA* 1937;109:951-2.
95. Sperti Sun Lamp not acceptable. *JAMA* 1938;110:1925.
96. Sun-Kraft Cold Quartz Ultraviolet Ray Therapy Lamp not acceptable. *JAMA* 1946;130:493.
97. Ultraviolet helps you keep fit [Hanovia Chemical and Manufacturing Company advertisement]. *Literary Digest* 1928;96:61.
98. Ultra-violet light for every home [General Electric, Mazda Sunlight Lamp advertisement]. *Colliers* 1931;88:39.
99. Artificial lighting for health. *Science* 1930;71(Suppl 10):11-2.
100. Answering your questions about ultra-violet [General Electric, Mazda Sunlight Lamp advertisement]. *Saturday Evening Post* 1932;204:1.
101. Have ultra-violet everywhere [General Electric, Mazda Sunlight Lamp advertisement]. *Saturday Evening Post* 1931;204:31.
102. Predicts sun lamp will bring new era. *New York Times* 1930 Jan 28;col 2:1, 19.
103. Says we will sleep under violet rays. *New York Times* 1931 Feb 11; col 6:28.