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### Title

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### Permalink

<https://escholarship.org/uc/item/6kt1s5fr>

### Journal

JAMA Dermatology, 155(4)

### ISSN

2168-6068

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### Publication Date

2019-04-01

### DOI

10.1001/jamadermatol.2018.5863

Peer reviewed

## VIEWPOINT

# Adapting to the Effects of Climate Change in the Practice of Dermatology—A Call to Action

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In October 2018, the United Nations Intergovernmental Panel on Climate Change (IPCC) released its landmark special report.<sup>1</sup> Written by 91 authors from over 40 countries, it presented a stark characterization of the consequences of climate change. In addition to elucidating the irreversible effects of the 1.0°C rise in average global temperature that has occurred since the industrial revolution began, the IPCC warned, in a global call to action, that limiting further warming to only 1.5°C will require rapid, expansive, and unprecedented changes to human behavior by 2030.<sup>1</sup> Shortly thereafter, the Fourth National Climate Assessment from the US government echoed these concerns: "Mitigation and adaptation efforts ... do not yet approach the scale considered necessary to avoid substantial damages to the economy, environment and human health over the coming decades."<sup>2(p69)</sup> Unfortunately, the ongoing politicization of climate change makes it challenging to take necessary actions. Physicians can provide a trusted voice to educate the public about the health hazards of climate change. Dermatologists, too, should become versed in the ways it threatens patients, practices, and well-being.

Climate change is the result of more than a century of anthropogenic emissions of greenhouse gases that foster heat retention from solar infrared radiation. Atmospheric warming has accelerated in recent decades: the 20 warmest years in recorded history have all occurred since 1995, and the five warmest have occurred since 2010.<sup>1</sup>

Climate change affects human health in myriad ways.<sup>3</sup> Rising temperatures alter the geographic range of infectious disease vectors and the viability of pathogenic microbes. Temperature rise and changes in precipitation promote desertification, which harms crops and animal husbandry, drives food insecurity, and negatively affects the nutritional status of vulnerable populations. Global warming contributes to steady glacial retreat, which affects many communities that depend on glacial-fed river systems for food and water security. Warming oceans and sea level rise have contributed to rapidly escalating hurricane strengths and increasingly severe storm surges, costing billions of dollars in property damages and threatening large-scale human displacement. Future climate change-induced extreme weather events, droughts, wildfires, and flooding will likely trigger refugee crises, leading to urban crowding, poor hygiene, impaired clean water access, disrupted health care services, hampered vaccination efforts, and the spread of communicable diseases. The World Bank estimates that, by 2030, 100 million people could be dragged into poverty as a direct consequence of climate change,<sup>4</sup> reversing decades of improvement in liv-

ing standards worldwide. All of these factors may contribute to global political instability. Indeed, the United States Department of Defense has warned that climate change represents an increasing threat to national security.<sup>2</sup>

Climate change will directly affect dermatology patients.<sup>5</sup> A growing body of literature calls attention to its effect on the geographic range of cutaneous infections, such as coccidioidomycosis. Previously endemic to the American Southwest, where arid, warm conditions favor its growth, at least 12 cases have now been reported as far north as eastern Washington State.<sup>5</sup> Among communicable diseases, dozens of studies link spikes in temperature and/or humidity with a rise in incident hand, foot, and mouth disease cases. Global warming likely contributes to the expanding geographic range of cutaneous leishmaniasis, now endemic in Texas. Other expanding vector-borne infections include Lyme disease, murine typhus, and the viruses transmitted by the *Aedes aegypti* mosquito vector, including Dengue, Chikungunya, and Zika. The geographic range of *A aegypti* has now expanded to include the southeastern United States, and these infections are likely to follow.<sup>5</sup> Dermatologists will be critical to their diagnosis, but this may require additional training.

Climate change is also poised to affect inflammatory and neoplastic skin conditions. Environmental pollutants from fossil fuel emissions and wildfires may trigger atopic dermatitis flares.<sup>6</sup> Recently, after a particularly devastating wildfire, San Francisco, Stockton, and Sacramento, California, became the most polluted cities in the world for several days.<sup>7</sup> The consequences were devastating for patients with reactive airway disease and other environmentally sensitive conditions. Schools were closed, and people were advised to limit outdoor activities. With many hospitals in Northern California operating at full capacity during recent wildfires, these events illustrate the vulnerability of the health care system's response to prolonged and extreme environmental disasters.

Pollutants potentiate oxidative damage to the skin,<sup>6</sup> and, combined with higher temperatures that affect sunlight exposure and UV-protective behaviors, contribute to skin aging and cancer.<sup>5</sup> The Lancet Countdown on Climate Change and Health points to the rising incidence of melanoma worldwide as an ongoing consequence of climate change.<sup>3</sup>

Global warming also affects the incidence of heat stroke. Furthermore, heat waves contribute to decreased workforce productivity, increasing the economic cost of climate change. They can also be fatal; in 2003, a prolonged heat wave in Europe took more than

70 000 lives.<sup>8</sup> Eccrine sweating provides the primary means to dissipate excess body heat, but this is impaired in several dermatologic disorders, in persons taking certain medications, in patients with chronic illnesses including diabetes and renal failure, and in children and the elderly. Indeed, the many health consequences of climate change will fall predominantly on already vulnerable populations such as these.

The IPCC report presented a dire forecast but also provided a roadmap detailing our best way forward. To limit warming to only 1.5°C, there will need to be a 50% reduction in carbon emissions worldwide by 2030. By 2050, 80% of global power will need to be generated using renewable resources.<sup>1</sup> Coal, which currently generates approximately 40% of global electrical power, will need to generate no more than 7% by 2050.<sup>1</sup>

There are many ways for concerned dermatologists to reduce their carbon footprint, both within their communities and in their professional activities. We can “green” our clinics by adopting wiser, less environmentally harmful practices. We can develop strategies to reduce our long-distance professional airplane travel. Greater reliance on telecommunication for professional education and networking, and provision of central locations and/or remote interviewing modalities to group residency and fellowship interviews, are other potential strategies. Recently, the American Medical Association announced it will divest from companies that obtain most of their

income from extracting and refining fossil fuels. Dermatologists could work within their professional organizations to encourage similar actions.

Our recently formed Climate Change and Environmental Affairs Expert Resource Group seeks to raise awareness and take collective action; interested American Academy of Dermatology (AAD) members and dermatology residents are welcome to join. The AAD recently joined the Medical Society Consortium on Climate and Health, which brings together 20 other medical societies around the consensus that climate change exerts a potentially devastating effect on health. Dermatologists can join the Consortium as individual advocates, working in their offices and communities to broaden awareness of the health consequences of climate change. The AAD Annual Meeting in March 2019 hosted an inaugural climate change forum, bringing together several dermatologist speakers with expertise in this area to describe ways climate change affects the skin and discuss what we can do about it.

We agree with Khalifian and Rosenbach, whose recent call to arms encouraged dermatologists to stand with the scientific community on this issue.<sup>9</sup> A comprehensive response to climate change is perhaps the single greatest public health challenge of our lifetime. This is a solvable problem, and physicians have a critical role to play in depoliticizing the issue and encouraging solutions. Please join us in taking action.

#### ARTICLE INFORMATION

**Published Online:** March 2, 2019.  
doi:10.1001/jamadermatol.2018.5863

**Conflict of Interest Disclosures:** None reported.

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