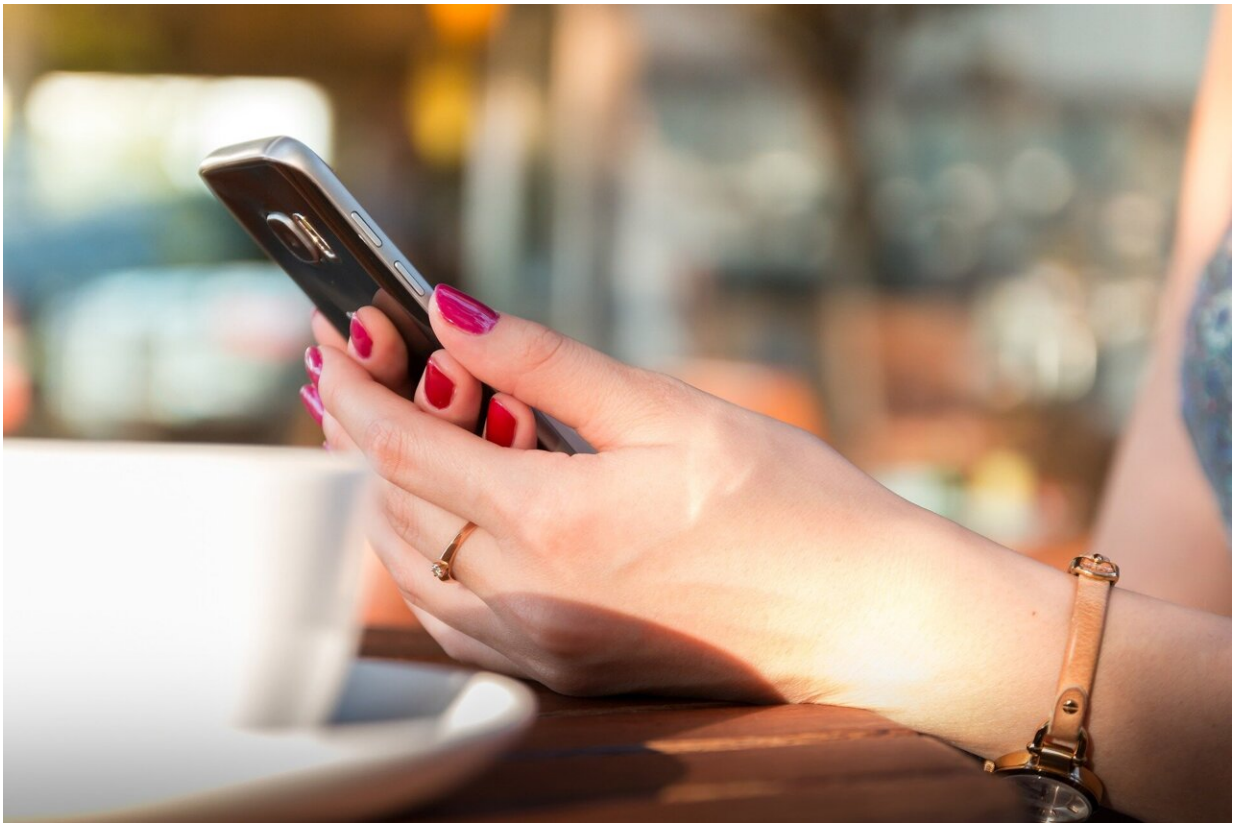


Cellphone radiation is harmful, but few want to believe it: researcher

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For more than a decade, [Joel Moskowitz](#), a researcher in the School of Public Health at UC Berkeley and director of Berkeley's Center for Family and Community Health, has been on a quest to prove that

radiation from cellphones is unsafe. But, he said, most people don't want to hear it.

"People are addicted to their smartphones," said Moskowitz. "We use them for everything now, and, in many ways, we need them to function in our daily lives. I think the idea that they're potentially harming our health is too much for some people."

Since cellphones first came onto the market in 1984, they have gone from clunky devices with bad reception to today's sleek, multifunction smartphones. And although cellphones are now used by nearly all American adults, considerable research suggests that long-term use poses health risks from the [radiation](#) they emit, said Moskowitz.

"Cellphones, [cell towers](#) and other wireless devices are regulated by most governments," said Moskowitz. "Our government, however, stopped funding research on the health effects of radiofrequency radiation in the 1990s."

Since then, he said, research has shown significant adverse biologic and health effects—including brain cancer—associated with the use of cellphones and other wireless devices. And now, he said, with the fifth generation of cellular technology, known as [5G, there is an even bigger reason for concern](#).

Berkeley News spoke with Moskowitz about the health risks of [cellphone](#) radiation, why the topic is so controversial and what we can expect with the rollout of 5G.

Berkeley News: I first heard you speak about the health risks of cellphone radiation at Berkeley in 2019, but you've been doing this research since 2009.

What led you to pursue this research?

Joel Moskowitz: I got into this field by accident, actually. During the past 40 years, the bulk of my research has been focused on tobacco-related disease prevention. I first became interested in cellphone radiation in 2008, when Dr. Seung-Kwon Myung, a physician scientist with the National Cancer Center of South Korea, came to spend a year at the Center for Family and Community Health. He was involved in our smoking cessation projects, and we worked with him and his colleagues on two reviews of the literature, one of which addressed the tumor risk from cellphone use.

At that time, I was skeptical that cellphone radiation could be harmful. However, since I was dubious that cellphone radiation could cause cancer, I immersed myself in the literature regarding the biological effects of low-intensity microwave radiation, emitted by cellphones and other wireless devices.

After reading many animal toxicology studies that found that this radiation could increase oxidative stress—free radicals, stress proteins and DNA damage—I became increasingly convinced that what we were observing in our review of human studies was indeed a real risk.

While Myung and his colleagues were visiting the Center for Family and Community Health, you reviewed case-control studies examining the association between mobile phone use and tumor risk. What did you find?

Our [2009 review](#), published in the *Journal of Clinical Oncology*, found that heavy cellphone use was associated with increased brain cancer

incidence, especially in studies that used higher quality methods and studies that had no telecommunications industry funding.

Last year, [we updated our review](#), published in the *International Journal of Environmental Research and Public Health*, based on a meta-analysis of 46 case-control studies—twice as many studies as we used for our 2009 review—and obtained similar findings. Our main takeaway from the current review is that approximately 1,000 hours of lifetime cellphone use, or about 17 minutes per day over a 10-year period, is associated with a statistically significant 60% increase in [brain cancer](#).

One thing I think we should address upfront is how controversial this research is. Some scientists have said that these findings are without basis and that there isn't enough evidence that cellphone radiation is harmful to our health. How do you respond to that?

Well, first of all, few scientists in this country can speak knowledgeably about the health effects of wireless technology. So, I'm not surprised that people are skeptical, but that doesn't mean the findings aren't valid.

A big reason there isn't more research about the health risks of radiofrequency radiation exposure is because the U.S. government stopped funding this research in the 1990s, with the exception of a [\\$30 million rodent study](#) published in 2018 by the National Institute of Environmental Health Sciences' National Toxicology Program, which found "clear evidence" of carcinogenicity from cellphone radiation.

In 1996, the Federal Communications Commission, or FCC, adopted exposure guidelines that limited the intensity of exposure to radiofrequency radiation. These guidelines were designed to prevent significant heating of tissue from short-term exposure to radiofrequency

radiation, not to protect us from the effects of long-term exposure to low levels of modulated, or pulsed, radiofrequency radiation, which is produced by cellphones, cordless phones and other wireless devices, including Wi-Fi. Yet, [the preponderance of research published since 1990](#) finds adverse biologic and health effects from long-term exposure to radiofrequency radiation, including DNA damage.

More than 250 scientists, who have published over [2,000 papers and letters](#) in professional journals on the biologic and health effects of non-ionizing electromagnetic fields produced by wireless devices, including cellphones, have signed the [International EMF Scientist Appeal](#), which calls for health warnings and stronger exposure limits. So, there are many scientists who agree that this radiation is harmful to our health.

Why did the government stop funding this kind of research?

The telecommunications industry has almost complete control of the FCC, according to Captured Agency, a monograph written by journalist Norm Alster during his 2014-15 fellowship at Harvard University's Center for Ethics. There's a revolving door between the membership of the FCC and high-level people within the telecom industry that's been going on for a couple of decades now.

The industry spends about \$100 million a year lobbying Congress. The CTIA, which is the major telecom lobbying group, spends \$12.5 million per year on 70 lobbyists. According to one of their spokespersons, [lobbyists meet roughly 500 times a year with the FCC](#) to lobby on various issues. The industry as a whole spends \$132 million a year on lobbying and provides \$18 million in political contributions to members of Congress and others at the federal level.

It reminds me of when the U.S. Surgeon General released a landmark report in 1964 that linked cigarettes with dangerous health effects, including cancer and heart disease. Even though the 10-person committee consulted more than 7,000 articles already available in biomedical literature, the report's findings were very controversial when they came out.

Yes, there are strong parallels between what the telecom industry has done and what the tobacco industry has done, in terms of marketing and controlling messaging to the public. In the 1940s, tobacco companies hired doctors and dentists to endorse their products to reduce public [health](#) concerns about smoking risks. The CTIA currently uses a nuclear physicist from academia to assure policymakers that microwave radiation is safe. The telecom industry not only uses the tobacco industry playbook, it is more economically and politically powerful than Big Tobacco ever was. This year, the telecom industry will spend over \$18 billion advertising cellular technology worldwide.

You mentioned that cellphones and other wireless devices use modulated, or pulsed, radiofrequency radiation. Can you explain how cellphones and other wireless devices work, and how the radiation they emit is different from radiation from other household appliances, like a microwave?

Basically, when you make a call, you've got a radio and a transmitter. It transmits a signal to the nearest cell tower. Each cell tower has a geographic cell, so to speak, in which it can communicate with cellphones within that geographic region or cell.

Then, that cell tower communicates with a switching station, which then searches for whom you're trying to call, and it connects through a copper cable or fiber optics or, in many cases, a wireless connection through microwave radiation with the wireless access point. Then, that access point either communicates directly through copper wires through a landline or, if you're calling another cellphone, it will send a signal to a cell tower within the cell of the receiver and so forth.

The difference is the kind of microwave radiation each device emits. With regard to cellphones and Wi-Fi and Bluetooth, there is an information-gathering component. The waves are modulated and pulsed in a very different manner than your microwave oven.

What, specifically, are some of the health effects associated with long-term exposure to low-level modulated radiofrequency radiation emitted from wireless devices?

Many biologists and electromagnetic field scientists believe the modulation of [wireless devices](#) makes the energy more biologically active, which interferes with our cellular mechanisms, opening up calcium channels, for example, and allowing calcium to flow into the cell and into the mitochondria within the cell, interfering with our natural cellular processes and leading to the creation of stress proteins and free radicals and, possibly, DNA damage. And, in other cases, it may lead to cell death.

In 2001, based upon the biologic and human epidemiologic research, low-frequency fields were classified as "possibly carcinogenic" by the International Agency for Research on Cancer (IARC) of the World Health Organization. In 2011, the IARC classified radiofrequency radiation as "possibly carcinogenic to humans," based upon studies of

cellphone radiation and brain tumor risk in humans. Currently, we have considerably more evidence that would warrant a stronger classification.

Most recently, on March 1, 2021, [a report was released by the former director of the National Center for Environmental Health at the Centers for Disease Control and Prevention](#), which concluded that there is a "high probability" that radiofrequency radiation emitted by cellphones causes gliomas and acoustic neuromas, two types of brain tumors.

Let's talk about the fifth generation of cellphone technology, known as 5G, which is already available in limited areas across the U.S. What does this mean for cellphone users and what changes will come with it?

For the first time, in addition to microwaves, this technology will employ millimeter waves, which are much higher frequency than the microwaves used by 3G and 4G. Millimeter waves can't travel very far, and they're blocked by fog or rain, trees and building materials, so the industry estimates that it'll need 800,000 new cell antenna sites.

Each of these sites may have cell antennas from various cellphone providers, and each of these antennas may have microarrays consisting of dozens or even perhaps hundreds of little antennas. In the next few years in the U.S., we will see deployed roughly 2.5 times more antenna sites than in current use unless wireless safety advocates and their representatives in Congress or the judicial system put a halt to this.

How are millimeter waves different from microwaves, in terms of how they affect our bodies and the environment?

Millimeter wave radiation is largely absorbed in the skin, the sweat glands, the peripheral nerves, the eyes and the testes, based upon the body of research that's been done on millimeter waves. In addition, this radiation may cause hypersensitivity and biochemical alterations in the immune and circulatory systems—the heart, the liver, kidneys and brain.

Millimeter waves can also harm insects and promote the growth of drug-resistant pathogens, so it's likely to have some widespread environmental effects for the microenvironments around these cell antenna sites.

What are some simple things that each of us can do to reduce the risk of harm from radiation from cellphones and other wireless devices?

First, minimize your use of cellphones or cordless phones—use a landline whenever possible. If you do use a cellphone, turn off the Wi-Fi and Bluetooth if you're not using them. However, when near a Wi-Fi router, you would be better off using your cellphone on Wi-Fi and turning off the cellular because this will likely result in less radiation exposure than using the cellular network.

Second, distance is your friend. Keeping your cellphone 10 inches away from your body, as compared to one-tenth of an inch, results in a 10,000-fold reduction in exposure. So, keep your phone away from your head and body. Store your phone in a purse or backpack. If you have to put it in your pocket, put it on airplane mode. Text, use wired headphones or speakerphone for calls. Don't sleep with it next to your head—turn it off or put it in another room.

Third, use your phone only when the signal is strong. Cellphones are programmed to increase radiation when the signal is poor, that is when one or two bars are displayed on your phone. For example, don't use

your phone in an elevator or in a car, as metal structures interfere with the signal.

Also, I encourage people to learn more about the 150-plus local groups affiliated with [Americans for Responsible Technology](#), which are working to educate policymakers, urging them to adopt cell tower regulations and exposure limits that fully protect us and the environment from the harm caused by wireless radiation.

Provided by University of California - Berkeley

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