

# Worried About 5G's Health Effects? Don't Be

There's little reason to think 5G frequencies are any more harmful than other types of electromagnetic radiation, like visible light.

**EVEN AS CARRIERS** around the world race to build 5G networks, some government officials are reaching for the throttle, citing fears that the new generation of wireless technology could pose health risks.

Earlier this year the Portland, Oregon, city council passed a resolution asking the Federal Communications Commission to update its research into potential health risks of 5G. (In 2013, the American Academy of Pediatrics made a similar request to the FCC about its research on cell phone use more generally.) In May, Louisiana's House of Representatives passed a resolution calling for the state Department of Environment Quality and Department of Health to study the environmental and health effects of 5G. Meanwhile, a few Bay Area towns, including Mill Valley and Sebastopol, want to block carriers from building 5G infrastructure.

"The impending rollout of 5G technology will require the installation of hundreds of thousands of 'small cell' sites in neighborhoods and communities throughout the country, and these installations will emit higher-frequency radio waves than previous generations of cellular technology," US representative Peter DeFazio (D-Oregon) wrote in a letter to the FCC echoing concerns about the new technologies involved with 5G.

There are real concerns about the way 5G is being deployed in the US, including security issues, the potential to interfere with weather forecasting systems, and the FCC steamrolling local regulators in the name of accelerating the 5G rollout. But concerns over the potential health impacts of

5G are overblown. If you weren't worried about prior generations of cellular service causing cancer, 5G doesn't produce much new to worry about. And you probably didn't need to be worried before.

Few 5G services will use higher frequencies in the near term, and there's little reason to think these frequencies are any more harmful than other types of electromagnetic radiation such as visible light.

Most concerns about health impacts from 5G stem from millimeter-wave technology, high-frequency radio waves that are supposed to deliver much faster speeds. The catch is that millimeter-wave transmissions are far less reliable at long distances than transmissions using the lower frequencies that mobile carriers have traditionally used. To provide reliable, ubiquitous 5G service over millimeter-wave frequencies, carriers will need a larger number of smaller access points.

That's led to two fears: That the effects of millimeter-wave signals might be more dangerous than traditional frequencies; and that the larger number of access points, some potentially much closer to people's homes, might expose people to more radiation than 4G services.

But millimeter waves aren't the only, or even the main, way that carriers will deliver 5G service. T-Mobile offers the most widespread 5G service available today. But it uses a band of low frequencies originally used for broadcast television. Sprint, meanwhile, repurposed some of the "mid-band" spectrum it uses for 4G to provide 5G. Verizon and AT&T both offer millimeter-wave-based services, but they're only available in a handful of locations. The wireless industry is focused more on using mid- and low-band frequencies for 5G, because deploying a massive number of millimeter-wave access points will be time-consuming and expensive. In other words, 5G will continue using the same radio frequencies that have been used for decades for broadcast radio and television, satellite communications, mobile services, Wi-Fi, and Bluetooth.

Even when carriers roll out more millimeter-wave coverage, you still won't need to worry much. Radio waves, visible light, and ultraviolet light are all part of the electromagnetic spectrum. The higher-frequency parts of the spectrum, including x-rays and gamma rays, are what's known as "ionizing radiation." This is the scary kind of radiation. It can break molecular bonds and cause cancer. Millimeter waves and other radio waves, along with visible light, are considered non-ionizing, meaning they don't break molecular bonds. They are higher frequency than traditional broadcast frequencies, but they're still below the frequency of visible light and far below ionizing radiation such

"Calling it 5G and changing the frequency does not change the relevant biological health factor, which is energy," says Robert DeMott, a toxicologist specializing in risk assessment at the consulting firm Ramboll.

Visible light is a common source of higher-frequency, higher-energy electromagnetic energy than millimeter waves or other mobile phone frequencies, says Eric S. Swanson, professor of nuclear physics at the University of Pittsburgh.

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ROBERT DEMOTT, RAMBOLL

That's not to say that overexposure to non-ionizing radiation can't have negative side effects. Electromagnetic energy produces heat, which is the "one and only" health concern posed by radio waves, says DeMott. That position is backed up by decades of research on the biological effects of non-ionizing radiation, including millimeter waves. A [paper](#) published in 2005 by the engineering professional organization IEEE's International Committee on Electromagnetic Safety reviewing more than 1,300 peer-reviewed studies on the biological effects of radio frequencies found "no adverse health effects that were not thermally related."

To protect against heat-related effects, the FCC and other regulators set limits on how much energy wireless devices can emit. "The normal

consensus is that you don't need to worry about a temperature increase of less than one degree Celsius because our bodies change by one degree Celsius in and of their own activities all the time, even at a cellular level," DeMott says.

Researchers have yet to find conclusive evidence linking mobile phone use to cancer or other health problems. Still, fears persist, in part because of inconclusive studies. Many critics of 5G and other wireless technologies point to the fact that the World Health Organization's International Agency for Research on Cancer classified mobile phones as "possibly carcinogenic" in 2011. What they don't usually mention is that the organization selected that designation, which also applies to coffee and pickled vegetables, after a 2010 study failed to determine whether cell phones posed a cancer risk. A fact sheet on the WHO website dating back to 2002 is more sanguine. "In the area of biological effects and medical applications of non-ionizing radiation approximately 25,000 articles have been published over the past 30 years," the fact sheet says. "Based on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields. However, some gaps in knowledge about biological effects exist and need further research."

There are, of course, individual studies that conflict with the scientific consensus that non-ionizing radiation poses health risks beyond heat. A study published last year by the National Toxicology Program noted an increased risk of cancer among male rats exposed to low-frequency radio waves. But the report didn't find a similar risk for female rats, nor for male or female mice. The researchers said the tumors found in male rats were similar to those seen in previous research of heavy cell phone users, but specified that the results shouldn't be extrapolated to humans.

These sorts of atypical results are to be expected, says Swanson. If you conduct tens of thousands of studies, he explains, you can expect that hundreds will show an increase in cancer or, or some other health

concern, by pure chance. That, along with a number of badly designed studies, provide fodder for critics.

But if you want a little more assurance that your phone probably isn't giving you a tumor, you can take comfort in knowing that, according to statistics published by the National Cancer Institute, the rate of brain cancer in the US actually went down between 1992 and 2016 even as mobile phone use skyrocketed.