

## Are Your Cell Phone and Laptop Bad for Your Health?



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In the wee hours of July 14, a 45-year-old Australian named John Patterson climbed into a tank and drove it through the streets of Sydney, knocking down six cell-phone towers and an electrical substation along the way. Patterson, a former telecommunications worker, reportedly had mapped out the locations of the towers, which he claimed were harming his health.

In recent years, protesters in England and Northern Ireland have brought down cell towers by sawing, removing bolts, and pulling with tow trucks and ropes. In one such case, locals bought the structure and sold off pieces of it as souvenirs to help with funding of future protests. In attempts to fend off objections to towers in Germany, some churches have taken to disguising them as giant crucifixes.

Opposition to towers usually finds more socially acceptable outlets, and protests are being heard more often than ever in meetings of city councils, planning commissions, and other government bodies. This summer alone, citizen efforts to block cell towers have sprouted in, among a host of other places, including California, New Jersey, Maryland, Illinois, North Dakota and north of the border in Ontario and British Columbia. Transmitters are already banned from the roofs of schools in many districts.

For years, towers have been even less welcome in the United Kingdom, where this summer has seen disputes across the country.

Most opponents cite not only aesthetics but also concerns over potential health effects of electromagnetic (EM) fields generated by the towers. Once ridiculed as crackpots and Luddites, they're starting to get backup from the scientific community.

It's not just cell phones they're worried about. The Tottenham area of London is considering the suspension of all wireless technology in its schools. Last year, Fred Gilbert, a respected scientist and president of Lakehead University in Ontario, banned wireless internet on his campus. And resident groups in San Francisco are currently battling Earthlink and Google over a proposed city-wide Wi-Fi system.

## **Picking up some interference?**

For decades, concerns have been raised about the health effects of "extremely low frequency" fields that are produced by electrical equipment or power lines. People living close to large power lines or working next to heavy electrical equipment are spending a lot of time in electromagnetic fields generated by those sources. Others of us can be exposed briefly to very strong fields each day.

But in the past decade, suspicion has spread to cell phones and other wireless technologies, which operate at frequencies that are millions to tens of millions higher but at low power and "pulsed."

Then there's your cell phone, laptop, or other wireless device, which not only receives but also sends pulsed signals at high frequencies. Because it's usually very close to your head (or lap) when in use, the fields experienced by your body are stronger than those from a cell tower down the street.

A growing number of scientists, along with a diverse collection of technology critics, are pointing out that our bodies constantly generate electrical pulses as part of their normal functioning. They maintain that incoming radiation from modern technology may be fouling those signals.

But with hundreds of billions in sales at stake, the communications industry (and more than a few scientists) insist that radio-frequency radiation can't have biological effects unless it's intense enough to heat your flesh or organs, in the way a microwave oven cooks meat.

It's also turning out that when scientific studies are funded by industry, the results are a lot less likely to show that EM fields are a health hazard.

## **Low frequency, more frequent disease?**

Before the digital revolution, a long line of epidemiological studies compared people who were exposed to strong low-frequency fields -- people living in the shadow of power lines, for example, or long-time military radar operators -- to similar but unexposed groups.

One solid outcome of that research was to show that rates of childhood leukemia are associated with low-frequency EM exposure; as a result, the International Agency for Research on Cancer has labeled that type of energy as a possible carcinogen, just as they might label a chemical compound.

Other studies have found increased incidence of amyotrophic lateral sclerosis (commonly called ALS or Lou Gehrig's disease), higher rates of breast cancer among both men and women, and immune-system dysfunction in occupations with high exposure.

Five years ago, the California Public Utilities Commission asked three epidemiologists in the state Department of Health Services to review and evaluate the scientific literature on health effects of low-frequency EM fields.

The epidemiologists, who had expertise in physics, medicine, and genetics, agreed in their report that they were "inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's disease, and miscarriage" and were open to the possibility that they raise the risks of adult leukemia and suicide. They did not see associations with other cancer types, heart disease, or Alzheimer's disease.

Epidemiological and animal studies have not been unanimous in finding negative health effects from low-frequency EM fields, so the electric-utility industry continues to emphasize that no cause-and-effect link has been proven.

### **High resistance**

Now the most intense debate is focused on radio-frequency fields. As soon as cell phones came into common usage, there was widespread concern that holding an electronic device against the side of your head many hours a month for the rest of your life might be harmful, and researchers went to work looking for links to health problems, often zeroing in on the possibility of brain tumors.

Until recently, cell phones had not been widely used over enough years to evaluate effects on cancers that take a long time to develop. A number of researchers failed to find an effect during those years, but now that the phones have been widely available for more than a decade, some studies are relating brain-tumor rates to long-term phone use.

Some lab studies have found short-term harm as well. Treatment with cell-phone frequencies has disrupted thyroid-gland functioning in lab rats, for example. And at Lund University in Sweden, rats were exposed to cell-phone EM fields of varying strengths for two hours; 50 days later, exposed rats showed significant brain damage relative to non-exposed controls.

The authors were blunt in their assessment: "We chose 12-26-week-old rats because they are comparable with human teenagers -- notably frequent users of mobile phones -- with respect to age. The situation of the growing brain might deserve special concern from society because biologic and maturational processes are particularly vulnerable during the growth process."

Even more recently, health concerns have been raised about the antenna masts that serve cell phones and other wireless devices. EM fields at, say, a couple of blocks from a tower are not as strong as those from a wireless device held close to the body; nevertheless many city-dwellers are now continuously bathed in emissions that will only grow in their coverage and intensity.

Last year, the RMIT University in Melbourne, Australia closed off the top two floors of its 17-story business school for a time because five employees working on its upper floors had been diagnosed with brain tumors in a single month, and seven since 1999. Cell phone towers had been placed on the building's roof a decade earlier and, although there was no proven link between them and the tumors, university officials were taking no chances.

Data on the health effects of cell or W-Fi towers are still sparse and inconsistent. Their opponents point to statistically rigorous studies like one in Austria finding that headaches and difficulty with concentration were more common among people exposed to stronger fields from cell towers. All sides seem to agree on the need for more research with solid data and robust statistical design.

San Francisco, one of the world's most technology-happy cities, is home to more than 2400 cell-phone antennas, and many of those transmitters are due to be replaced with more powerful models that can better handle text messaging and photographs, and possibly a new generation of even higher-frequency phones.

Now there's hot-and-heavy debate over plans to add 2200 more towers for a city-wide Earthlink/Google Wi-Fi network. On July 31, the city's Board of Supervisors considered an appeal by the San Francisco Neighborhood Antenna-Free Union (SNAFU) that the network proposal be put through an environmental review -- a step that up to now has not been required for such telecommunications projects.

In support of the appeal, Magda Havas, professor of environmental and resource studies at Trent University in Ontario submitted an analysis of radio-frequency effects found in more than 50 human, animal, and cellular-level studies published in scientific journals.

Havas has specialized in investigating the effects of both low- and high-frequency EM radiation. She says most of the research in the field is properly done, but that alone won't guarantee that all studies will give similar results. "Natural variability in biological populations is the norm," she said.

And, she says, informative research takes time and focus: "For example, studies that consider all kinds of brain tumors in people who've only used cell phones for, say, five years don't show an association. But those studies that consider only tumors on the same side of the head where the phone is held and include only people who've used a phone for ten years or more give the same answer very consistently: there's an increased risk of tumors." In other research, wireless frequencies have been associated with higher rates of miscarriage, testicular cancer, and low sperm counts.

Direct current from a battery can be used to encourage healing of broken bones. EM fields of various frequencies have also been shown to reduce tissue damage from heart attacks, help heal wounds, reduce pain, improve sleep, and relieve depression and anxiety. If they are biologically active enough to promote health, are they also active enough to degrade it?

At the 2006 meeting of the International Commission for Electromagnetic Safety in Benevento, Italy, 42 scientists from 16 countries signed a resolution arguing for much stricter regulation of EM fields from wireless communication.

Four years earlier, in Freiburger, Germany, a group of physicians had signed a statement also calling for tighter regulation of wireless communication and a prohibition on use of wireless devices by children. In the years since, more than 3000 doctors have signed the so-called "Freiburger Appeal" and documents modeled on it.

But in this country, industry has pushed for and gotten exemption from strict regulation, most notably through the Telecommunications Act of 1996. Libby Kelley, director of the Council on Wireless Technology Impacts in Novato, California says, "The technology always comes first, the scientific and environmental questions later. EM trails chemicals by about 10 years, but I hope we'll catch up."

Kelley says a major problem is that the Telecommunications Act does not permit state or local governments to block the siting of towers based on health concerns: "We'll go to hearings and try to bring up health issues, and officials will tell us, 'We can't talk about that. We could get sued in federal court!'"

### **High-voltage influence?**

Industry officials are correct when they say the scientific literature contains many studies that did not find power lines or telecommunication devices to have significant health effects. But when, as often happens, a range of studies give some positive and some negative results, industry people usually make statements like, "Technology A has not been proven to cause disease B."

Michael Kundi, professor at the Medical University of Vienna, Austria and an EM researcher, has issued a warning about distortions of the concept of cause-and-effect, particularly when a scientific study concludes that "there is no evidence for a causal relationship" between environmental factors and human health. Noting that science is rarely able to prove that A did or did not "cause" B, he wrote that such statements can be "readily misused by interested parties to claim that exposure is not associated with adverse health effects."

Scientists and groups concerned about current standards for EM fields have criticized the World Health Organization (WHO) and other for downplaying the risks. And some emphasize the risk of financial influence when such intense interest is being shown by huge utilities and a global communications industry that's expected to sell \$250 billion worth of wireless handsets per year by 2011 (that's just for the instruments, not counting monthly bills). *Microwave News* cited Belgian reports in late 2006 that two industry groups -- the GSM Association and Mobile Manufacturers Forum -- accounted for more than 40 percent of the budget for WHO's EM fields project in 2005-06.

When a US National Academy of Sciences committee was formed earlier this year to look into health effects of wireless communication devices, the Center for Science in the Public Interest and Sage Associates wrote a letter to the Academy charging that the appointment of two of the committee's six members was improper under federal conflict-of-interest laws.

One of the committee members, Leeka Kheifets, a professor of epidemiology in UCLA's School of Public Health, has, says the letter, "spent the majority of the past 20 years working in various capacities with the Electric Power Research Institute, the research arm of the electric power industry."

The other, Bernard Veyret, senior scientist at the University of Bordeaux in France, "is on the consulting board of Bouygues Telecom (one of 3 French mobile phone providers), has contracts with Alcatel and other providers, and has received research funding from Electricite de France, the operator of the French electricity grid." The NAS committee will be holding a workshop this month and will issue a report sometime after that.

A paper published in January in the journal *Environmental Health Perspectives* found that when studies of cell phone use and health problems were funded by industry, they were much less likely to find a statistically significant relationship than were publicly funded studies.

The authors categorized the titles of the papers they surveyed as either negative (as in "Cellular phones have no effect on sleep patterns"), or neutral (e.g., "Sleep patterns of adolescents using cellular phones"), or positive, (e.g., "Cellular phones disrupt sleep"). Fully 42 percent of the privately funded studies had negative titles and none had positive ones. In public or nonprofit studies, titles were 18 percent negative and 46 percent positive.

Alluding to previous studies in the pharmaceutical and tobacco industries, the authors concluded, "Our findings add to the existing evidence that single-source sponsorship is associated with outcomes that favor the sponsors' products."

By email, I asked Dr. John Moulder, a senior editor of the journal *Radiation Research*, for his reaction to the study. Moulder, who is Professor and Director of Radiation Biology in the Department of Radiation Oncology at the University of Wisconsin, did not think the analysis was adequate to conclusively demonstrate industry influence and told me that in his capacity as an editor, "I have not noted such an effect, but I have not systematically looked for one either. I am certainly aware that an industry bias exists in other areas of medicine, such as reporting of clinical trials."

Moulder was lead author on a 2005 paper concluding that the scientific literature to that point showed "a lack of convincing evidence for a causal association between cancer and exposure to the RF [radio-frequency] energy used for mobile telecommunications."

The Center for Science in the Public Interest has questioned Moulder's objectivity because he has served as a consultant to electric-power and telecommunications firms and groups. Moulder told me, "I have not done any consulting for the electric power and telecommunications industry in years, and when I was doing consulting for these industries, the journals for which I served as an editor or reviewer were made aware of it."

A year ago, *Microwave News* also reported that approximately one-half of all studies looking into possible damage to DNA by communication-frequency EM fields found no effect. But three-fourths of those negative studies were industry- or military-funded; indeed, only 3 of 35 industry or military papers found an effect, whereas 32 of 37 publicly funded studies found effects.

Magda Havas sees a shortage of public money in the US for research on EM health effects as one of the chief factors leading to lack of a rigorous public policy, telling me, "Much of the research here ends up being funded directly or indirectly by industry. That affects both the design and the interpretation of studies." As for research done directly by company scientists, "It's the same as in any industry. They can decide what information to make public. They are free to downplay harmful effects and release information that's beneficial to their product."

Meanwhile, at Trent University where Havas works, students using laptops are exposed to radio-frequency levels that exceed international guidelines. Of that, she says, "For people who've been fully informed and decide to take the risk, that's their choice. But what about those who have no choice, who have a cell-phone tower outside their bedroom window?"

"It's the equivalent of secondhand smoke. We took a long time to get the political will to establish smoke-free environments, and we now know we should have done it sooner. How long will it take to react to secondhand radiation?"

For more information, visit [Environmental Health Perspectives](#); [Microwave News](#); [the National Center for Biotechnology Information](#).

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