

## Are Wifi Emissions Killing You Slowly?

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by Peter M. Ferenczi on Tuesday, March 11, 2008

**First came the cell phone scare. Now Wi-Fi and other wireless emissions are under the microscope. Are these fresh worries based on solid science or just more static?**



Most of us don't consider our wireless gadgets a health risk. But while neo-Luddites and tinfoil-hat wearers have been sounding the alarm for decades, the safety of wireless signals is getting attention in circles that might make you take notice: The World Health Organization, the European Environmental Agency, and the British Health Protection Agency are all asking questions, not just about cell phones, but about lower-power signals such as Wi-Fi. Could the cloud of "weak" signals from Bluetooth, Wi-Fi, and Wireless USB radios really be the next asbestos? Where hard science, junk science, and politics come together, the signal gets choppy.

### Signs and Symptoms

It's a justified question. We're all drenched in radio signals all the time, and people don't seem to be keeling over, right? Well, kind of. Hundreds of thousands of people worldwide claim to suffer symptoms, ranging from itchy skin to fatigue and nausea, that they attribute to radio waves, including low-power emissions such as Wi-Fi. The condition is known as electrosensitivity, or electrohypersensitivity if the symptoms are particularly debilitating. "In Sweden, this is fully recognized as a functional impairment," said Dr. Olle Johansson, associate professor in the department of Neuroscience at the Karolinska Institute in Stockholm. In a 2002 survey in California, 3.2 percent of respondents reported being "allergic or very sensitive" to being near electrical devices. According to Johansson, a Swedish survey reported electrohypersensitivity in 3.1 percent of Swedes. Johansson believes that radio frequency (RF) radiation may well be affecting us. "If you look at the research papers and boil down the knowledge, it says that very short exposures to very low levels, sometimes hundreds of thousands of times below the recommended exposure levels, still give effects that, from a human health point of view, could be devastating in the long term," he said.



Johansson isn't alone in his concern. He was among 31 researchers who drafted and signed the Benevento Resolution in 2006, calling on governments to take a number of precautionary steps to reduce RF exposures and inform the public on exposure levels from technologies like Wi-Fi and WiMax. He also contributed to the BioInitiative Report (along with the European Environmental Agency), a 600-page document proposing that conventional guidelines for RF exposure inadequately take into account the biological realities of how organisms are likely to react to RF radiation.

But don't pull the plug on your Wi-Fi router just yet; the opinion of the scientific community is hardly unanimous. "We've all been exposed to TV and FM radio for quite some time," said Dr. Michael Clark, science spokesman for the U.K. Health Protection Agency (HPA). "There isn't hard evidence of adverse health effects." That said, the HPA has launched an investigation to study Wi-Fi exposures in schools. Why? "I think it's very similar to [the situation with] mobile phones ten years ago: When there's a sudden increase in use, the proper thing to do is to get basic information about how much people are exposed to," Clark said.

Yet for some, precautions are already warranted. Germany's Federal Environmental Ministry has recommended that people minimize their exposure to Wi-Fi and other wireless signals by using wired technologies when possible. Proposed Wi-Fi deployments have raised controversies in schools. Canada's Lakehead University has instituted a policy that restricts Wi-Fi in areas served by wired connections. "The only new deployment of Wi-Fi [since the decision] has been in student-controlled space. And students have the option of being exposed or not, as long as the location is appropriately posted and the radiation contained within the site," said Fred Gilbert, president of the university.

## Radiation 101

Before trying to separate precaution from paranoia, a quick brush-up on what those wireless signals really are is in order. All radio waves are electromagnetic radiation—energy moving through space. Most of our short-distance data RF signals (Bluetooth and Wi-Fi) are in the microwave frequency band, the same range that microwave ovens use to heat food (this is why nuking a bag of Jiffy Pop can disrupt wireless networks in the vicinity).

But while an oven may blast food with 1,000 watts of microwave energy, a Wi-Fi access point transmits around 100 milliwatts, 10,000 times less.

Exposure guidelines such as those set by the International Commission on Non-Ionizing Radiation Protection are based largely on the assumption that cooking our heads is probably unhealthy, so human exposures should be kept below levels that create "thermal effects," meaning heating up our tissues like a microwave oven would. Mobile gadgets don't kick out enough energy to warm things up, so thermal effects aren't a concern there.

"People have sat down and, based on thermal effects and model experiments not dealing with biology, concluded what's safe," said Johansson, who is critical of the guidelines. Researchers are also finding "non-thermal" biological effects, or effects in biological systems not caused by heating. These effects aren't considered in the most widely applied guidelines, an omission that's the focus of the BioInitiative report.

## The Great Debate



The significance of nonthermal biological effects and the potential health risks predicted by research describing them are contested. "If you banned things purely on the evidence of biological effects, you couldn't drink cold water or Coca-Cola," said the HPA's Clark, noting that those substances will kill cells *in vitro*. He said that unlike the well-documented negative health effects of alcohol and tobacco, "a bank of evidence does not exist for exposure to radio frequencies at below guideline levels."

"I have conducted a review on the entire body of literature," said Dr. Riadh W. Y. Habash, a scientist with the McLaughlin Centre for Population Health at the University of Ottawa and author of *Electromagnetic Fields and Radiation: Human Bioeffects and Safety*. "The majority of the studies indicate negative results," he said, meaning no effect was found from "power densities below guideline levels." However, the verdict isn't quite unanimous.

"There are papers, based on cellular and animal studies, that came back with positive results," said Habash, noting several studies that found that RF energy could damage genetic material or promote tumor growth in animals. "But these are just a few papers among thousands," he emphasized.

Controlled studies are required to understand potential biological effects of low-power RF, but epidemiological studies have also been performed that look for correlations between RF exposure and human health problems. "There's not a lot of clarity given the diverse array of exposure subsumed under RF, but there is good reason to believe that health harm is unlikely," said Dr. David Savitz, director of the Epidemiology, Biostatistics, and Disease Prevention Institute at the Mount Sinai School of Medicine.

"To my knowledge, there is no clear evidence of any health harm [at exposures] below the level of tissue heating, though there are suspicions that are worthy of consideration," he said.

Despite the lack of clear evidence, Savitz noted that the difficulties in knowing with any certainty the RF exposures that a given population has received make epidemiological studies problematic. "In the absence of accurately measured exposure, there is a predictable tendency for studies to underestimate any adverse effects, i.e., fail to detect harm that this truly presents."

And what about the thousands of people who believe themselves to be electrohypersensitive? An exhaustive 2005 review of research on the topic concluded while the symptoms described by sufferers were "severe and sometimes disabling," the research results suggest "that 'electromagnetic hypersensitivity' is unrelated to the presence of [electromagnetic fields]."

## Cell Phones: Off the Hook?

Although Wi-Fi-class RF is getting some scientific attention, it's nothing compared to the focus on cell phones, which have been around for much longer and spend their functional lives mashed against people's heads. A typical GSM phone transmits an average of around 250 milliwatts, with peaks up to 2 watts, more than the 100-milliwatt output of most Wi-Fi devices and a hundred times the power of the typical Bluetooth headset. "Exposures from mobile phones are liable to be much higher than anything from Wi-Fi, so we wouldn't envisage looking for health effects [from Wi-Fi] yet because it's not clear there are any health effects from phones," said the HPA's Clark, adding that, on the basis of measurements the HPA has done so far, 20 minutes of talking on a cell phone gives as much RF exposure as sitting in a Wi-Fi equipped classroom for a year. The HPA's Wi-Fi study is designed to measure exposures and confirm expectations that they're much lower than RF doses from cell phones. "If there were effects from mobile phones, then maybe you would have to look more carefully at Wi-Fi," said Clark.

## Low Power Doesn't (Necessarily) Mean Low Risk

The Interphone study, the world's most ambitious epidemiological search for health effects from cell phone usage, an international effort involving data from 13 countries, is likely to be published in 2008. "If the Interphone study came out and said there's a definite effect, it would change things; we would have to review all of our advice," said Clark. Some countries have already begun to publish conclusions based on their data, but the results have brought more controversy than consensus, which casts shadows on the hope that the final conclusions will be the definitive answers everyone is waiting for.

And some feel that no matter what the final verdict on phones is, lower-power technologies won't be off the hook. "If I shout or whisper something, you still understand it," said Johansson. "Many of the researchers are coming from physics, and they're used to thinking in terms of levels. But in biology, levels are less important," he said. "As a scientist, I'm more concerned about the information content [of the signal] and how it interacts with ionic channels, transmitter molecules, cell membrane proteins, and so on, and at levels that from a physical point of view may even be hard to measure."

Habash agreed that levels aren't everything. "When it comes to nonthermal effects, it's possible that it's not only the [energy] absorption that may lead to a health effect; there are issues related to the modulation of signal and frequency used," he said. "These factors need further investigation, beyond the energy itself," Habash said, adding that the papers already published in this area have reported both positive and negative results.

## Risk, Uncertainty, and Politics

Science, by its nature, will never "prove" that RF energy is safe. "In biology, you can never use the word 'proof,'" Johansson said. "What you have are statistically significant differences." Even if every study conducted found no evidence of harm from RF, it wouldn't prove conclusively that RF energy is safe: It would mean that it hasn't been shown to be unsafe.

Human health studies are further complicated because we can't experiment on each other willy-nilly, and epidemiology studies can't really prove cause, only correlation. Controlled laboratory studies may find hard evidence of biological effects. But, "the problem isn't with biological effects," Habash said. "The question is if the biological effect leads to a health effect." The answer is likely to be less clear-cut than the experimental results themselves.

And then, there are politics and influence. The Interphone study is partly funded by the telecom industry's interests, albeit through a mechanism designed to protect the impartiality of the research. The Biolinitiative Report was edited in part by Cindy Sage, owner of Sage Associates, an environmental consultancy that assesses sites for RF exposure levels and offers RF shielding solutions. Johansson admitted that this was a "flaw on the image" of the report but emphasized that Sage had no input on the research performed. "She was the only person willing to do the enormous job of compiling and collecting and calling" required to bring the report together, he said.

Risk and uncertainty are difficult topics in risk-averse cultures like our own. "We become more cautious when in fact we're healthier than we've ever been," said Clark, calling it a "strange paradox."

"I believe we should balance between the benefit and the risk of technology," said Habash. "Technology is killing people every day," he said, citing car travel as a risk we trade for a benefit. But while the risks of vehicle accidents are statistically exact, the risks, if any, from the RF energy around us remain murky. "I have published two books in this regard, and studied the field for more than 20 years," Habash said, "and I can't give you any hard answers."

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