

Little evidence linking cancer with Power Lines

By JOE SCHWARCZ, The Gazette September 20, 2009

Electrical power lines don't scare me. But people who say that they should, do. Why? Because I think they are raising unjustified fears, triggering undue stress, and causing the spending of public funds that could be much more usefully allocated. Let me say at the start that I have no expertise in electricity. I think, however, that I do have a pretty good handle on evaluating who does, as well as on appraising the scientific literature. I'm also well aware that views expressed on the effects of power lines, on both sides of the debate, may be motivated by factors other than the pursuit of pure science.

The current controversy, though, did begin with the pursuit of pure science. Back in 1970s Nancy Wertheimer, a psychologist at the University of Colorado, teamed up with physicist Ed Leeper to examine possible causes for childhood cancer in Denver. They discovered that children diagnosed with cancer, particularly leukemia, were more likely to be living in the vicinity of electrical power lines. This raised the possibility of a connection between the electromagnetic fields generated by power lines and childhood leukemia, a theory laid out by Wertheimer and Leeper in a paper published in the *American Journal of Epidemiology* in 1979.

Wertheimer and Leeper's observation generated much discussion among scientists and triggered a number of other investigations. The issue, though, didn't electrify the public until ten years later when investigative journalist Paul Brodeur wrote a piece in the highly respected *New Yorker* magazine, painting a terrifying picture of the supposedly catastrophic health effects of power lines. He went on to petrify the public with his ominously titled book, "Currents of Death: Power Lines, Computer Terminals, and the Attempt to Cover Up Their Threat to Your Health." Scientists who supported the notion of risk were portrayed as righteous mavericks seeking the truth in face of an onslaught of false information spread by unscrupulous researchers who either worked for the electrical power companies or were bought off by them. Brodeur's discussions had all the trappings needed for public alarm: children with cancer, invisible force fields, experts expressing concerns, and alleged government and industry conspiracies to cover up risk. What it didn't have was sound science to support the fears that were raised.

Of one claim there is no doubt. Any current flowing through a conductor generates both electric and magnetic fields. In North America electricity is supplied by a 60 Hz alternating current, meaning that the flow of electricity changes direction sixty times a second. All wiring therefore, whether in electrical appliances or in power lines is surrounded by oscillating electric and magnetic fields. Paul Brodeur's interpretation of this is that the fields "cause every molecule in the body to vibrate back and forth at 60 Hz, and anybody with a grain of sense knows that day in and day out, that can't be very good for you." That's not sense, it's nonsense.

The molecules in our body are in a constant state of motion and the effects of an external 60 Hz field are trivial in comparison to the forces generated by the changing energy fields created by the electrical activity that goes on in our heart, brain and muscles. Furthermore, physics dictates that the energy of electromagnetic radiation is directly proportional to its frequency. Sixty Herz is a very low frequency, way less than that of visible light, and way, way less than that needed to break chemical bonds in DNA, the most common cancer inducing process.

Recognizing that these low frequency fields lacked the energy to disrupt molecules, some proponents of the power line-leukemia link have suggested alternate explanations. They claim that levels of melatonin, a hormone produced by the pineal gland in the brain, are reduced on exposure to electromagnetic fields. Since melatonin has antioxidant, cancer-protective effects, any reduction can increase cancer risk. Sounds interesting. While it is true that melatonin levels may be marginally reduced by magnetic fields, studies have failed to show a link between melatonin and cancer. There is simply no plausible biological rationale for a 60 Hz field causing cancer.

Of course a lack of biological rationale doesn't preclude the possibility. Only evidence can do that. Wertheimer and Leeper didn't actually measure magnetic fields in homes, they estimated them from the vicinity of power lines. A number of later studies actually measured magnetic fields and found no consistent relation to leukemia. Even when associations were found, there was no dose-response effect. In other words, greater exposure did not increase risk, a real curiosity in light of what we know about toxicology. Perhaps the most telling study was carried out by the National Cancer Institute in the U.S. in 1997. Over six hundred children with leukemia, as well as an equal number of controls, had the magnetic fields in their homes measured. No association with field strength was found, a finding that was echoed by a huge British study that looked at thousands of leukemia cases matched with controls.

Furthermore, no animal experiments have produced malignancies, even with fields much larger than the ones humans are exposed to. And the incidence of leukemia has not increased in spite of a dramatic rise in the use of electric power and appliances.

Why then has the controversy not faded away? Some investigators who have built a career on forging links between power lines and cancer are motivated to keep the issue alive to ensure further funding. When you dredge data you can always come up with some anomaly. But when all the relevant science is taken into account, the conclusion is that if there is an effect, it is infinitesimal, otherwise there would be no debate. So, a parent who decides to move a child from a school close to a power line to a further but "safer" one, is making a poor decision. The risk of a traffic accident is far greater than any risk attributable to power lines.