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NEWSFRONT

DO HIGH-VOLTAGE

POWER LINES

CAUSE CANCER

Studies link Electromagnetic Fields (EMFs) To Illness

By NEAL LAWRENCE

It was sort of a funny story when we first heard about it a few years ago: A dairy farmer living in Wisconsin near high voltage utility company transmission lines couldn't turn out the lights in his barn. Even with the switches in the off position, night after night after he had finished his chores, he'd go back out to the barn to find the light bulbs still glowing from the electrical charge hovering in the air. The cows were none too happy about it either, because the constant light prevented them from sleeping, and they gave less milk.

But the story doesn't seem so funny any more -- not after the spate of recent reports of children developing deadly illnesses or adults dying prematurely of rare diseases -- all apparently because they had the misfortune of living near high amounts of electrical current.

A growing body of scientific evidence suggests that invisible electromagnetic fields (EMFs) -- created by everything from high-voltage utility company lines to personal computers, microwave ovens, TVs and even electric blankets -- are linked to a frightening array of cancers and other serious health problems in children and adults.

Though it received scant attention from the mainstream press, a report leaked last October from the U.S. National Council on Radiation Protection said there is a powerful body of impressive evidence showing that even very low exposure to electromagnetic radiation has long-term effects on health.

The report cited studies that show EMFs can disturb the production of the hormone melatonin, which is linked with sleep patterns. It said there was strong evidence that children exposed to EMFs had a higher risk of leukemia.

This follows on the heels of three epidemiological reports released in 1994. One indicated a tie between occupational exposure to EMFs and Alzheimer's disease. Another suggested a link with Sudden Infant Death Syndrome (SIDS). The third study indicated a tie with Amyotrophic lateralsclerosis.

Now a surprising new report released in February by physicists at Britain's University of Bristol shows that power lines attract particles of radon -- a colorless, odorless gas irrefutably linked with cancer.

What's this all about? And why have the media failed to report with the appropriate emphasis the implications of these significant health risks?

Shortly after her son Kevin was diagnosed with leukemia, Julie Larm of Omaha, NE. began to notice other children at the local pool who had lost their hair or had surgical scars. As her suspicion rose, she began talking to other parents. One person she contacted was Dee Hendricks, whose son was also undergoing cancer treatment. Together they collected the names of eleven children in the area who had cancer.

When they plotted them on a map they were surprised to see that all lived within one mile of each other and an electric power substation.

"If there was nothing to worry about, why does our utility have an EMF committee...which was in effect long before we came and started making noise?" asks Larm, a member of the Omaha Parents for the Prevention of Cancer. "Why do they need such things if there's nothing to it?"

The group's efforts have been buttressed by Paul Brodeur, a campaigning environmental journalist who had in his day taken on asbestos and chlorofluorocarbons and is the author of two books on the subject of EMFs. Brodeur is convinced that EMFs are one of the greatest environmental threats facing the nation.

"Never before has there been this much epidemiological evidence of the carcinogenicity of any agent," says Brodeur, "and that agent declared to be benign."

Robert Becker, M.D., author of *Cross Currents* (Tarcher, 1990), who has studied this subject since the 1960s warns, "EMFs could turn out to be a far worse environmental disaster, affecting far more people, than toxic waste, radiation or asbestos."

To some, especially the families of people with unexplained cancers, the sheer volume of research that has been carried out on this issue suggests there must be a cancer connection and perhaps a cover-up. Their suspicion is heightened by the fact that many of the studies are funded by the utility industry, which would be directly affected by the studies' outcomes.

At the heart of the matter is a relatively simple and well-understood physical phenomenon: When an electric current passes through a wire, it generates an electromagnetic field that exerts forces on surrounding objects. Electric fields arise from the strength of an electric charge; magnetic fields, from the charge's motion.

Unlike ionizing radiations such as x-rays -- which pack sufficient wallop to knock electrons out of the molecules that make up the human body -- EMFs do not produce charged particles, so experts always believed they posed no danger. Therefore, the Federal government has never regulated EMFs, and the electric industry was allowed to set its own standards.

But other recent experimental studies have shown that even weak magnetic fields can change the chemistry of the brain, impair the immune system, and inhibit the synthesis of melatonin, a hormone known to suppress several types of tumors and to be present in reduced amounts in men as well as women who develop breast cancer.

Some lab tests have confirmed that EMFs affect living cells in a variety of ways, most of them harmful. (Scientists are intrigued, however, by their ability to speed slow-healing fractures, enhancing bone formation).

What's confusing is that the studies have produced widely divergent and often contradictory results. On the one hand, many scientists are convinced the study of electromagnetic fields is a massive waste of time and money -- costing an estimated one billion dollars a year. After years of extensive study, Dr. Garry Boorman says, "We're not sure what part of the field, if any, is toxic or important, or could be hazardous to your health."

As a PBS "Frontline" documentary reported, scientists have been unable to locate a mechanism by which electromagnetic fields would trigger a biological reaction. The energy in the fields to which most of us are exposed is tiny tens of millions of times too small to break the molecules in cells. All living organisms evolved in the presence of the earth's magnetic field, which is two hundred times larger.

Dozens of animal experiments have been carried out in which rats and mice are exposed to very large magnetic fields for long periods -- some for their entire lives -- but no animal has ever been proven to contract cancer due to this exposure. Generations of rodents raised in the presence of high magnetic fields do not show any increased evidence of birth defects or depressed immune systems.

With no animal data to support the claim and no physical mechanism to explain how it might affect the body, the main support for a connection has come from epidemiology.

As for clusters like the ones which motivated Julie Larm and her group in Omaha, many scientists are skeptical about their significance, if any, to the debate about EMFs. Because conditions like cancer are surprisingly common about one-third of the population gets cancer in their lifetimes random clusters of the disease are not unusual and are found close to and far from power lines.

Still, because of our reliance on electricity and the potential financial consequences for utilities and other companies, the regulation of EMFs is a

politically sensitive issue. There is evidence to establish that the Bush administration tried to suppress findings of a study by the Environmental Protection Agency linking electromagnetic fields to certain health problems. The Clinton White House, meanwhile, has been largely silent on the issue.

Cover-Up?

Lending credence to claims that there is, indeed, a public health risk from EMFs and that the government knows about it is that an EPA report a few years ago raised suspicions of a causal link between electromagnetic fields and leukemia, brain tumors, breast and prostate cancer, even birth defects.

Less-publicized but still significant are some of the foreign studies. Last July, Canadian researchers told the *Lancet* medical journal they had found a high rate of leukemia among children whose mothers had worked at sewing machines while pregnant.

Checks showed the operators were exposed to more electromagnetic radiation than people who work on power lines or in power stations. In another study, Swedish researchers assessed the long-term exposure of people living near high-voltage transmission lines by taking spot measurements of the field strength in each home, and using them to confirm the accuracy of a computer model that calculated the strength of the fields emitted by each of the lines, according to distance from the lines, the wiring configurations, and the current level the lines were known to be carrying.

Then they programmed a computer with records of past current loads that had been maintained over the previous 20 years for each of the transmission lines. They were thus able to pinpoint with great accuracy EMF exposure for each cancer victim. What they found was a clear dose-response relationship between exposure to even weak power-frequency electromagnetic fields and the development of cancer, especially acute and chronic myeloid leukemia.

A second Swedish study, which also employed cases and controls, was conducted by epidemiologists. It confirmed that average magnetic field exposure over time was the critical factor in the development of disease. Interestingly, these studies were funded in part by the Swedish utility industry.

Maria Feychting of Sweden's Karolinska Institute looked at 127,000 children who lived near big power lines for over 25 years and found twice the risk of leukemia.

"In our study we found about a two-fold increase in the risk if the children were living close, within 50 meters (yards) of a big power line," she told Britain's Channel Four television.

The new study by the University of Bristol showing that power lines can attract cancer-causing gases like radon has heightened concerns.

Even scientists who have failed to find a reason for the apparent link refuse to say it is safe to live near a high-voltage power line.

Warning to Parents

Of critical importance to all parents is that some studies have suggested that children exposed to magnetic fields of between two and three milligauss or above experienced a significantly increased risk of developing cancer. Since ambient levels of two to three milligauss can routinely be measured in buildings within 50 to 150 feet of wires carrying strong electric current, these findings are especially troublesome.

The report leaked last October by the mellitus National Council on Radiation Protection recommended a safety limit of 0.2 microteslas, a very weak field compared to those generated by household appliances. A person standing one foot away from a vacuum cleaner or electric drill can be exposed to anywhere between two and 20 microteslas.

There is no way to block EMFs (they even penetrate lead shielding), and the only protection is distance from the source.

In our electronic age, its almost impossible to eliminate exposure to the myriad of electrical sources with which we come in contact on a daily basis.

Thousands of electric company substations are scattered throughout our cities large and small and they abut homes, apartments and office buildings -- even schools. Since few of the high-voltage lines that lead into and out of these substations have been buried to prevent harmful emissions, magnetic fields of potent strength can be found virtually everywhere.

Concerns have also been raised about magnetic fields given off by faulty household wiring, by high-current conductors concealed in the walls, ceilings and floors of commercial office buildings and other large structures; and by high-voltage transformers that can be found in almost any large building.

The EPA Raises Questions

Concerns about so-called non-ionizing radiation began to mount in 1979, when a study of cancer rates among Colorado school children determined that those who lived near power lines had two or three times as much chance to develop cancer. The link seemed so improbable that power companies eagerly paid to have the study replicated. To their surprise, the subsequent scientific inquiry supported the original findings, which have since been buttressed by a variety of additional

studies and reports of increased cancer rates among workers employed in the electric industry.

One such study, conducted by the Fred Hutchinson Cancer Research Center in Seattle, WA. confirmed that telephone linemen, electricians and electric-power workmen are developing breast cancer at six times the expected rate.

But it was the Environmental Protection Agency's scientific review that has had an explosive impact, lending the most credence to those who have been warning of EMF health hazards.

The report -- a 367-page document entitled "Evaluation of the Potential Carcinogenicity of Electromagnetic Fields" -- came to light in 1990, when someone in the agency leaked a draft version of it to Louis Slesin, editor of an influential newsletter called Microwave News.

Chief among the conclusions was one specifying that power line electromagnetic fields should be classified as a "probable human carcinogen." William Farland, then-director of the EPA's Office of Health and Environmental Assessment ordered this conclusion deleted from the report.

Then the Associated Press reported that the Bush administration tried to delay release of the EPA's findings. Robert E. McGaughey, the project manager and chief author of the report, was quoted as saying that the White House "was concerned not about the accuracy of the report...[but] about how people would react to the news and how it would affect the electric power industry."

Ultimately, after two major TV networks and newspapers throughout the country exposed the Bush administration's efforts at censorship, the report was released. It contained a disclaimer that asserted "the controversial and uncertain nature of the scientific findings of this report" and declared that it should not be construed as "representing Agency policy or position."

The Medical Connection

Just how EMFs affect humans is still not entirely known.

In the case of cancer, most specialists theorize that a malignant tumor forms in at least two stages. In the first, referred to as "initiation," an outside agent damages the cell's genetic material. Because EMFs are not strong enough to break molecular and chemical bonds, scientists are concentrating on the second stage of cancer, a series of steps called "promotion." Researchers are trying to pinpoint ways in which EMFs might cause cells to grow and multiply abnormally.

Some studies suggest that EMFs may promote cancer by interfering with the transmission of calcium across the cell membrane, a flow that governs such processes as muscle contraction, egg fertilization, cell division, and growth. EMFs

may also disturb a cell's ability to process hormone, enzyme, and other biological signals that regulate normal growth.

EMFs are known to affect nerve impulses. Melatonin, a regulatory hormone secreted by the pineal gland near the brain, ordinarily stimulates immune responses and may suppress tumor growth. Reduced melatonin production has been linked to breast and prostate cancer. Melatonin secretion in turn is controlled by norepinephrine, a neurotransmitter in the brain. Receptors for its relative, the hormone epinephrine, are disturbed by EMFs.

Some doctors stated that their observations led them to believe that it was possible that magnetic fields stimulate the rate of cancer cell growth, or act as a cancer promoter.

A San Antonio researcher discovered human cancer cells exposed to 60 Hz fields (the frequency of a high-voltage line) grew as much as 24 times as fast as unexposed cells and showed greatly increased resistance to destruction by the cells of the body's defense system.

Female breast cancer has reached epidemic proportions, with one in ten American women developing it and one in four dying. Alarming, of women who develop the disease, 55% have no known risk factors. Breast cancer mortality rates are five times lower in Asia and Africa than in industrialized North America and northern Europe regions where EMFs are omnipresent.

Electric Companies On the Spot

A contention of the electric utility industry in the United States had been that the pathologies referred to in most of the studies might actually have been induced by exposure to pesticides, chemicals or other toxic agents in the environment.

For a time they contended that if power-line magnetic fields really did cause cancer, the fivefold increase in electrical usage during the past 30 years would have been expected to have produced an epidemic of childhood leukemia. The utility industry stopped making this statement in June of 1991, after the National Cancer Institute disclosed that a study it had made showed that in recent years there had been unexplained increases of nearly 11% in childhood leukemia, and of more than 30% in childhood brain cancer.

A study in the American Journal of Industrial Medicine reported a steep increase in brain-cancer rates over the past dozen years among the general population.

People working with computer monitors are developing primary brain tumors at nearly five times the expected rate.

Still, as Dr. Becker observes, "Companies wont admit that EMFs are risky, because they will become liable. And the government wont, because it is the

largest user of the electromagnetic spectrum, especially for military communications. Our whole economy depends on them now."

Not surprisingly, as people begin to focus on the problem of EMFs, **property values near power lines and electric substations have been plummeting, and numerous lawsuits have been filed.**