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The Case for EMF Precautionary Policies

WHO and Public Health Officials Stand in the Way

Eight Wrongheaded Excuses Debunked in London

Precautionary policies to protect children from power line electromagnetic fields (EMFs) should have been adopted years ago. It's a no-brainer, yet health officials continue to sit on their hands.

There has long been widespread agreement that EMFs are linked to childhood leukemia. They are also likely to play a role in both brain and breast cancer as well as in miscarriages and in neurological diseases such as Alzheimer's and ALS, also known as Lou Gehrig's disease.

But health agencies have been unwilling to move against these largely preventable risks. It's astonishing that those charged with promoting public health—*not* just electric utility executives—are the roadblocks to change.

The most recent betrayal came in November when the World Health Organization's (WHO) EMF project refused to recommend any action under the precautionary principle. The WHO report reads more like a business plan than a road map for promoting children's health. Indeed, its first option for dealing with EMFs is to "do nothing."

Nor does the WHO want anyone else to take firm action. Mike Repacholi, the head of the EMF project, and his assistant Leeka Kheifets are discouraging national health officials from setting new stricter exposure standards for power-frequency EMFs. Instead they continue to endorse a recklessly lenient exposure limit of 1,000 mG (100 uT). This is inexcusable given that the threshold for the childhood leukemia risk appears to be about 3-4 mG. They don't even advocate some kind of ALARA policy (reducing exposures "as low as reasonably achievable"), an option which has been used to control ionizing radiation risks for generations.

Unfortunately, the WHO is hardly alone. In the US, the National Cancer Institute (NCI), the National Institute of Environmental Health Sciences (NIEHS), the National Council on Radiation Protection and Measurements (NCRP) and the American Cancer Society have all refused to alert the public about EMFs. In the UK and many other countries, health agencies are also remaining silent.

Utilities are sure to resist changes in EMF policies and the only way they

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will ever mitigate exposures is if they are forced to do so. But what's the excuse for those whose mission is to protect public health? Why doesn't the public health community speak up?

Eight Possible Excuses—All Bogus

Over the years, those who stand in the way of stricter exposure rules have offered eight reasons:

• Epidemiological studies linking childhood leukemia to EMFs are flawed and unreliable.

• Epidemiological studies carried out in the US and the UK don't show a link between EMF exposure and childhood leukemia.

• Despite a steady increase in electrification over the last century, there has been no parallel increase in the incidence of childhood leukemia.

• There is no conceivable mechanism by which EMFs can influence the development of leukemia.

• EMFs can't cause cancer because the fields don't have enough energy to break chemical bonds.

• Air pollution from roadway traffic is a more important risk factor for childhood leukemia than EMFs.

• A virus is a more likely cause of childhood leukemia.

• And even if it were true that EMFs could lead to childhood leukemia, the risk is so small that it's not worth bothering about.

Each one of these excuses is wrong. Every single one of them.

This was brought home at the *International Conference on Childhood Leukemia*, held in London, September 6-10, sponsored by Children with Leukemia, a UK charity. All the potential risk factors were on the agenda. There were lectures on ionizing radiation, viruses, air pollution, light-at-night and EMFs. It was a rewarding and eye-opening week—and infuriating because in the end there was simply no way to excuse the indifference and complacency of those charged with protecting the public from EMFs. Here's the real story.

EMF Epidemiological Studies Show a Consistent and Robust Cancer Effect

The epidemiological evidence linking EMFs to childhood leukemia is "rather strong and consistent," said Anders Ahlbom in London. He believes that there is no point doing any more epidemiological studies, at least until we know how EMFs can trigger or promote cancer. If a biophysical mechanism were in hand, Ahlbom would no doubt drop all the caveats and qualifiers.

Ahlbom, one of the world's leading epidemiologists, is the deputy director of the Institute of Environmental Medicine at the Karolinska in Stockholm. He has been studying EMFs and childhood leukemia for 20 years and is known to be cautious and not to overreach.

In the early 1990s, Ahlbom and Maria Feychting put the skeptics on the run when they published their study of childhood leukemia and power lines in Sweden. But their study had only a small number of cases and there remained some uncertainty as to how reliable the results really were.

Ahlbom then assembled epidemiologists from nine different countries, each of whom had carried out their own EMF-leukemia studies. They combined and analyzed all their raw data and found that the link became stronger—and undeniable. In 2000, they announced that children who lived in fields of over 4 mG (0.4 uT) had twice as much leukemia as those exposed to less than 1 mG.

Any lingering doubts were put to rest by a second meta-analysis, headed up by another eminent epidemiologist, Sander Greenland of the University of California in Los Angeles (UCLA). Greenland, using a somewhat different mix of past studies, came up with essentially the same result.

The International Agency for Research on Cancer (IARC) was convinced. In the summer of 2001, an IARC panel unanimously classified EMFs as a possible human carcinogen, largely based on the Ahlbom and Greenland papers. The committee even came close to upgrading the threat level and designating EMFs as a "probable" cancer agent. One of those who argued for the stronger classification was Chris Portier of the US NIEHS.

Even after the two meta-analyses were completed, additional epidemiological studies have been released that also support the EMF–cancer link. At the London leukemia conference, a Japanese team led by Michinori Kabuto reported that it too had found support for the association—with an even higher estimated risk. Children exposed to 4 mG or more had close to five times the expected rate of leukemia.

WHO's Repacholi's main excuse for refusing to act on the epidemiological studies is they are biased. It's true that epidemiology has its imperfections and is susceptible to errors. But, in the case of EMFs, essentially all the reliable epidemiological studies point to a leukemia risk. It seems highly unlikely that whatever errors were made in each of the different countries all around the world, they all led to a finding that EMFs are linked to higher rates of childhood leukemia. Mistakes would have a random effect and sometimes lead to a finding of no risk. But that was not the case,

In London, Anders Ahlbom put concerns about the reliability of the epidemiology to rest. Confounding by other possible risk factors (for instance, air pollution from traffic, etc.) "does not seem to be a real issue," he said. And if the methodology had biased the result, he added, the effect would have been small with a very limited impact on the overall risk estimates.

And then Ahlbom, dropped a bombshell. For the first time, he suggested that there was probably a leukemia risk *below* 4 mG because, he said, it is unlikely that there is a threshold for the EMF effect.

Though the risk below 4 mG would be quite small for any single individual, he argued, the societal risk would be significant due to the huge number of children exposed to low-level

fields. The net result, Ahlbom advised, would be that same number of children would develop leukemia below 4 mG as above 4 mG. In one step, Ahlbom doubled the number of children at risk of leukemia from EMFs.

Anders Ahlbom's message was clear: The epidemiology is reliable and the EMF leukemia risk is beyond reasonable doubt.

The US and UK Studies Do Point to a Leukemia Risk

The conventional wisdom is that the US and UK leukemia studies—led by Martha Linet of the National Cancer Institute (NCI) and Nick Day of the University of Cambridge, respectively—show no link to EMFs. This was the view offered by the study teams when they released their results and was further bolstered by commentaries that accompanied their publication.

In 1997, an editorial in the *New England Journal of Medicine*, "Power Lines, Cancer and Fear," which appeared in the same issue as the Linet study, proclaimed that it was time to stop *all* EMF research. The headline of the *New Scientist*'s editorial following the release of the 1999 Day study needs no elaboration: "It's Official. Power Lines Don't Give Children Leukemia."

They wanted everyone to believe that the issue was now closed.

But, as is so often the case, the conventional wisdom is wrong. The Linet and Day studies *are* major components of the Ahlbom meta-analysis. (The Linet study, but not Day's, was also included in the Greenland meta-analysis). If they had been as dead negative as was being portrayed, the meta-analysis would also have shown no leukemia risk.

Together the US and UK studies contributed more than half the total number of leukemia cases from the nine countries participating in the Ahlbom meta-analysis. The original 1992 Swedish study, though clearly pointing to a cancer risk, made up only 2% of Ahlbom's overall total and had little impact on his final risk estimate.

The US study by itself has the largest number of cases with exposures above 4 mG and it does indicate a leukemia risk above this level. In its published meta-analysis, Ahlbom's team noted that when the US data were excluded, the association between EMFs and childhood leukemia actually became weaker and its statistical significance became marginal. Far from negating the leukemia risk, the US data amplified it.

Nick Day's UK study is also an integral part of the EMF leukemia equation. But it turns out that there are even stronger data that have been kept out of public sight. In October, the news media revealed—thanks to a leak from power line activists—that a UK Department of Health study of 70,000 children showed that children who live near power lines had double the risk of developing leukemia.

Gerald Draper, who led that study at the Childhood Cancer Research Group in Oxford, told the press that he kept the results under wraps because he had been surprised by the result. Surprised? Not likely. Draper's findings are entirely consistent with what had been reported in any number of previous studies. It could only be surprising if Draper was unaware of the EMF epidemiological literature that had accumulated over the last 25 years. Now, that would be surprising.

Draper, the National Radiological Protection Board (NRPB) and the UK Department of Health have been sitting on these findings for a couple of years—some say, longer. No one seemed to be at all embarrassed by the revelation that they have long been keeping people in the dark.

The disconcerting fact is that cancer researchers in the US, the UK and elsewhere have felt no need to set the record straight and tell the public that there is indeed an EMF health risk.

Leukemia Rates Are Rising in US, UK and All Over Europe

When the EMF controversy was heating up in the early 1990s, David Jackson, a particle physicist turned amateur epidemiologist at the University of California, Berkeley, set out to show that EMFs could not promote cancer. His argument was deceptively simple: The use of electric power had surged in the 20th century bringing much more human exposure to EMFs. So if EMFs were to pose a cancer risk, there would have been a parallel increase in cancer. Since cancer rates have held steady, EMFs must be harmless. Simple, but wrong.

Most rank-and-file epidemiologists immediately dismissed Jackson's thesis. (Why do so many people think they can do epidemiology as well, if not better, than those trained to be epidemiologists?) Nevertheless, Jackson won a large following among those eager to debunk the EMF health risk. Among the most zealous of these were some of Yale University's most senior physics professors, including Robert Adair, William Bennett and Allan Bromley.

In an elegant presentation at the opening session of the London conference, Michel Coleman, a professor of epidemiology and medical statistics at the London School of Hygiene and Tropical Medicine, showed that the incidence of childhood leukemia in the UK has in fact been going up, on average, about 1% per year. Even this small rate of growth compounds to an overall increase of about 60% over the last 50 years—and a fivefold jump over the 20th century. No one knows what is causing this "steady increase," Coleman said.

Britain is not alone. Childhood leukemia is also rising in the US. The NCI reports that the annual number of cases of leukemia went up by over 60% between 1950 and 2000, an increase of just less than 1% a year, about the same rate as in the UK.

And this December, IARC announced that cancer rates among children in 19 European countries have been increasing over the last 30 years—once again by about 1% per year.

In his talk, Sam Milham, an American epidemiologist who in 1982 first reported that EMF-exposed workers had elevated rates of leukemia, presented a series of graphs showing how rates of leukemia have changed over the 20th century among children of various ages. He made a strong case that the now well-known peak in the incidence of leukemia, which occurs among 2- to 7-

year-olds, did not exist prior to the widespread electrification of the US in the 1920s. With each passing decade one could see that the peak had become more and more distinct in the incidence curves. That same growth of the childhood leukemia peak can be seen in the new IARC study which was published in the December 11 issue of *The Lancet.*

Milham estimates that if needless EMF exposure were to be stopped, 60% of all childhood leukemia could be prevented.

EMFs Can Cause DNA Breaks Without Breaking Chemical Bonds

The reason that epidemiologists often appear to be ambivalent about emphasizing the link between EMFs and childhood leukemia is that no one knows how the fields can trigger or promote cancer.

Take for example, the most recent review by members of ICNIRP's epidemiology committee. "On initial consideration, it is not obvious that EMFs would pose any hazard to human health," they wrote. "In particular, this radiation has insufficient energy to damage DNA directly, and therefore in principle should not be capable of initiating cancers." The chair of this committee is none other than Anders Ahlbom, who has done more than anyone else to legitimize the EMF–leukemia link.

It's true that power-frequency EMFs do not have enough quantum energy to break a chemical bond, but that does not mean that they cannot damage DNA.

What too often goes unmentioned is that at least half a dozen research labs have reported an increase in the number of DNA breaks among cells exposed to power-frequency EMFs. That's still a big step away from understanding how EMFs can damage DNA, but it does say that DNA is susceptible to EMFs and it gives us clues as to where to look for the underlying mechanisms.

Henry Lai was the first to show, back in 1997, that power-frequency EMFs can cause both single and double-strand DNA breaks. In his talk in London, Lai listed five published studies from other labs that have also documented EMF-induced DNA damage. At the same time, he also acknowledged that five other labs had failed to see a similar effect.

Lai then took the next logical step. He attempted to reconcile the conflicting findings. He outlined a model in which magnetic fields lead to the production of free radicals, molecules that can damage DNA. Using this hypothesis, he was able to explain why at least two of the labs had failed to see the DNA breaks following EMF exposure. Lai sees a measure of consistency where others see only mess of conflicting results.

Few physicists have devoted much time to trying to explain what EMFs may be capable of doing. Some theories have been proposed, but much more work needs to be done. Mechanisms of interaction have always been a tough problem. We have long accepted that cigarette smoke and asbestos are potent carcinogens, but only recently have we come to understand the way they do their dirty work. And there is still much to learn about even these "well-established carcinogens."

There's Much To Learn About Causes Of DNA Damage and About Much Else

On the last day of the London meeting, David Gee of the European Environment Agency reminded the audience that "misplaced certainty about the absence of harm" has caused a lot suffering over the years. He urged everyone to have a little "more humility" and a little "less hubris" about what we think we know about the way nature works.

Previous talks by Eric Wright of the University of Dundee and Munira Kadhim of the UK Medical Research Council were perfect illustrations of what Gee was talking about. Over the last ten years, Wright and Kadhim have nurtured a paradigm shift on how ionizing radiation can affect DNA. Simply put, they have shown that what was once thought to be highly improbable does in fact happen—if one knows how and where to look.

They outlined three very surprising observations: First, ionizing radiation can damage *unexposed* cells. Wright explained that by using a sharply focused radiation beam, one could see genetic effects among cells that are outside the target area. That is, DNA that was not hit by any radiation still showed clear evidence of damage. This has become known as the "bystander effect." The DNA breaks must have occurred by some mechanisms other than a direct attack on DNA chemical bonds. The precise mechanism of action is still murky, but some type of communication among the cells is likely at work.

Second, exposing the parts of the cell where there is no DNA to ionizing radiation can still result in DNA damage.

And third, radiation effects sometimes only become apparent a long time after exposure. Kadhim has found that irradiated cells that appear to be normal can lead to offspring which, some generations later, have a higher than expected rate of spontaneous mutations. This is known as radiation-induced genomic instability.

Kadhim has also found that ionizing radiation effects do not always follow a simple linear dose-response relationship. She has sometimes observed more pronounced effects at low exposures than at high ones. "What is going on at high doses is completely different from what is going on at low doses," she said.

However heretical all these findings may seem, they are now part of the mainstream science of radiation biophsyics. "There is now strong evidence from studies in a number of different cell culture systems that [the bystander effect and genomic instability] are real," wrote John Little of Harvard University in a recent review article.

Fifteen years ago the late Ross Adey, one of the world's leading EMF researchers, described how cells regulated their growth and survival by exchanging information. "Cells in body tissue initiate weak electrical and chemical signals by which they can 'whisper together' in a private language necessary for normal health of the tissue," Adey wrote in 1990. "*If this normal pattern of communication is interrupted, unregulated cell growth may result*" [his emphasis]. Cancer is often defined as unregulated cell growth and could well result from such garbled exchanges of information. Much remains to be learned about this "private

language" and how EMFs can interfere with "conversations" among cells.

The day after Wright and Kadhim had outlined these once-unexpected genetic effects, Russell Foster presented his own perhaps even more startling breakthrough. Foster works with visible light and has discovered that, in addition to the well-known rods and cones, there is a third type of photoreceptor in the human eye. This novel photoreceptor regulates circadian rhythms and, in turn, may play a crucial role in cancer development.

(A quick aside on how scientists handle new ideas: Foster commented that he had had a very hard time publishing his findings on this new photoreceptor. He could not get his paper through peer review. His scientific colleagues—the very people who are trained to have an open mind in their search to understand the world around them—were closed to his discovery. In this case, happily, Foster persevered and got his papers into print. But let there be no doubt that the deck can be stacked against those who venture against the prevailing dogma.)

If we are still learning crucial aspects of what is surely one of the most studied parts of the human sensory system, how do we take seriously claims that EMFs cannot affect us? After hearing from Foster, Kadhim and Wright, some advice from Socrates, later offered by David Gee, seemed particularly apt: "Wisdom is to know that you don't know."

Air Pollution Plays Only a Small Role, If Any, in Childhood Leukemia

Concern that air pollution from road and highway traffic could be a risk factor for childhood leukemia arose after Nancy Wertheimer and Ed Leeper, and later David Savitz, implicated EMFs. Many of the early studies on air pollution and leukemia used data sets that had been collected for EMF epidemiological studies.

EPRI, the research arm of the US electric utility industry, nurtured and exploited the air pollution threat—if only to get EMFs off the hook. But EPRI was going down a blind alley. In her presentation in London, Peggy Reynolds, an epidemiologist at the California health department, said that later studies, specifically designed to investigate the role of air pollution, did not support the link.

One single study, however, does point to a relatively strong air pollution risk—it stands out like Gulliver among the Lilliputians when placed next to other similar efforts. This one study is by two other amateur epidemiologists, who had years of support from EPRI.

Robert Pearson and Howard Wachtel say they see a sixfold increase in leukemia among children living near high-traffic roads. Pearson is an engineer who worked for the Public Service Company of Colorado, an electric utility, for close to 20 years and Wachtel is an electrical engineer at the University of Colorado in Boulder and a former EPRI fellow. Over the years, EPRI has spent hundreds of thousands of dollars on Pearson and Wachtel's efforts. The only real result has been a muddying of the EMF waters.

Leeka Kheifets and Kristie Ebi were in charge of EPRI's contracts with Pearson and Wachtel. In 2001 Kheifets left EPRI to join Mike Repacholi at the WHO EMF project. Not long after, Ebi took a partial sabbatical from EPRI to work at the WHO Regional Office for Europe in Rome where she wrote a chapter on EMF risks to children for the European Environment Agency. She concluded that any EMF effect "is likely to be small." That she was also working for EPRI went unmentioned.

The same people who orchestrated efforts in the US to downplay the EMF threat then promoted a similar agenda at the WHO in Europe. Kheifets's opinions while she was at EPRI were no secret. The fact that Repacholi recruited her to be his principal assistant could well be interpreted to indicate that he never had any plans to limit children's exposures to EMFs.

Search for a Leukemia Virus Continues And Will No Doubt Go On and On

The possibility that an infectious agent could lead to childhood leukemia looks doubtful. Nothing has yet emerged despite years of hunting. There is no direct evidence of a virus, said Robin Weiss of University College, London, at the end of his talk. "Infection might not be relevant to childhood leukemia," he cautioned.

Leo Kinlen of Cancer Research UK in Oxford is the main proponent of a virus theory. Mel Greaves of the Institute of Cancer Research in London favors a somewhat more complicated hypothesis. In his two-step model, leukemia results from a common infectious agent, transmitted by population mixing, which prompts an abnormal immune response caused by some genetic event that had occurred in the womb.

Greaves did not attend the London conference, leaving the floor to Kinlen, who, undeterred by Weiss's skepticism, made the case for an infectious agent. He closed his talk with the claim that a particularly large cluster of childhood leukemia in Fallon, Nevada, was a "confirmation" of his theory.

Fallon is the home of a Naval Strike and Air Warfare Center. According to one recent estimate, a cluster as big as the one identified there (11 cases between 1999 and 2001) would occur in the US by chance every 22,000 years.

A naval base is a population mixing bowl. Tens of thousands of military personnel go in and out of Fallon every year: 55,000 people were temporarily assigned to the base in 2000, compared with 20,000 in 1990. Those 55,000 men and women could well have triggered the cluster, Kinlen said.

But Kinlen's argument lost its footing when Alasdair Philips, one of the organizers of the conference and the leader of Powerwatch, an influential activist group, asked why an influx of 20,000 visitors a year had not been enough mixing to initiate the cluster. Kinlen offered no convincing response.

Sam Milham later wondered why no one had mentioned the 37 powerful radars that are located at the Fallon training complex. He also thought that the idea that high-frequency electro-

magnetic radiation might play a role in childhood leukemia would have developed more traction if a second leukemia cluster in Sierra Vista, Arizona, were better known. Sierra Vista is the home of Fort Huachuca, another electronic warfare center—this one run by the US Army. More than 40 years ago, Milham identified a cluster of childhood leukemia in Oneida County, home of Griffiss Air Force Base in Rome, New York. *The Lancet*, one of the world's leading medical journals, published Milham's observation of this abnormal clustering, back in 1963.

There Is Much More At Stake Than Childhood Leukemia

The meta-analyses show that exposing children to more than 3-4 mG doubles their risk of leukemia. According to a recent estimate from one of these pooled studies, approximately 1% of childhood leukemia cases are attributable to EMFs. Factoring in what Ahlbom said in London about the risk of those exposed to less than 4 mG doubles the attributable fraction to 2%.

For the US, this means that about 180 cases of leukemia may be due to EMFs each year—with many more in the rest of the world. Let's assume that EMFs are responsible for 1,000 cases of childhood leukemia a year. Would that be enough for the WHO and other health agencies to issue a warning to minimize EMF exposures? What about 3,000 cases? How about 5,000?

Whatever the number might actually be, there can be no doubt that it is dwarfed by the annual toll due to AIDS, influenza, and the many other diseases that are at the top of WHO's agenda. But this is not a rationale for doing nothing.

Another way to deal with competing health risks is to use similar safety factors in setting exposure standards. In his presentation at the London conference, Michael Kundi of the University of Vienna showed that applying the same guidelines as the WHO uses for air pollutants to EMFs would lead to an exposure limit of 2 mG (0.2 uT). This would be a 500-fold reduction of the current ICNIRP standard of 1,000 mG (100 uT).

There is another important reason to reduce exposures: Childhood leukemia could be just the tip of the EMF iceberg. This link to EMFs has been relatively well studied compared with that of the many other diseases that may also be brought on by EMFs. Some of these are quite common.

A report from the California health department recently concluded that exposures to power-frequency EMFs are likely associated with adult brain cancer, ALS (Lou Gehrig's disease) and miscarriages, as well as childhood leukemia. In addition, there are possible links to breast cancer, Alzheimer's disease and childhood brain cancer. If some of these connections turn out to be real, then the cost-benefit equation would tilt sharply toward adopting strict exposure limits.

Why EMF Risks Get No Respect

The Public Pushes for Change...

If none of these reasons carry much weight, why are EMFs health risks so easily dismissed? It's tempting to say that most people don't believe the fields actually exist. No one can see, hear, feel, taste or touch EMFs, so maybe people think that they aren't really there. (Activists have found an easy way to showcase the fields by lighting up fluorescent tubes under a high-voltage power line.)

But that isn't the answer. The public has long been the principal driver of the EMF issue. In the 1980s, citizen concern over a new 765-kV power line prompted the New York State research program, which confirmed the 1979 Wertheimer-Leeper leukemia study. And a decade later, similar public fears led to the $7 million California EMF program which, as we have just seen, led to an expansion of the list of EMF-linked diseases far beyond childhood leukemia. And without pressure from citizens across the country, the federal research program, known as EMF RAPID, would never have gotten off the ground.

When the public first learned about EMFs—primarily from the writings of Paul Brodeur in *The New Yorker* during the late 1980s and early 1990s—the issue quickly moved from near-total obscurity to the top of Americas's environmental priorities.

In Europe the public has also set the EMF agenda. But because the primary interest there has been on cell phones and towers, power-frequency EMFs have gotten only a small amount of attention. Switzerland and Italy stand out as exceptions, however: Each has adopted some of the most stringent exposure standards for power-frequency EMFs in the world.

...But Advocacy Groups and The Media Don't Follow

A more likely explanation for institutional complacency is that environmental, consumer and labor groups, which often lobby for legislative and regulatory reforms, have not supported EMF activists. Environmental Defense, Friends of the Earth, the Natural Resources Defense Council, Greenpeace and Consumers Union have all shied away from the EMF arena, virtually guaranteeing that current exposure limits will remain unjustly high.

Even Children with Leukemia, the charity that sponsored the London meeting, refused to highlight the need to control EMF exposures. Each day of the meeting, its publicists issued press releases and made keynote speakers available for inter-

views. The risks from ionizing radiation, light-at-night, diet and chemical pollutants were all promoted, and the British newspapers responded accordingly, though it is not clear whether headlines like the one in the *Daily Express*—"How a Curry Can Help in Cancer Fight"—helped or hindered the cause.

Nor did anyone at the charity appear to be embarrassed when the *Daily Telegraph* ran a front-page story under the headline "Night Light Link to Child Leukemia"—even after Thomas Erren of Germany's University of Cologne, a member of the conference scientific committee, pointed out that not a single study had ever linked light-at-night to childhood leukemia.

Yet when it came to publicizing the EMF risk, Children with Leukemia got cold feet. A press release calling for precautionary policies, pegged to Michael Kundi's talk, was prepared but never distributed to reporters. "We did not feel we had a chance to convey the message without creating undue public alarm," explained Edward Copisarow, the charity's chief executive. "We want to generate public concern, not public alarm." (An earlier draft endorsing Kundi's 2 mG (0.2 uT) proposal had been quickly scuttled as far too radical.)

What is particularly surprising about Copisarow's hesitant approach to EMFs is that Eddie O'Gorman, who founded the charity after his son Paul died of leukemia at the age of 14, firmly believes that EMFs brought on Paul's cancer.

While the British press will run as many EMF stories as it can find, many US reporters and editors long ago dismissed EMFs as the junk-science flavor of the month. The *New York Times* has led the pack. When Paul Brodeur's *New Yorker* articles were published in book form under the provocative title, *Currents of Death*, Bill Broad, a *Times* science writer, ridiculed Brodeur by drawing a parallel between his claims and those of a "person asserting the earthly presence of space aliens."

Broad is one among many. Respected magazines (*The Atlantic*) and television news shows (*Frontline*) have also denounced those who say that EMFs can affect health.

The Electric Utilities Control The Agenda...

With a free pass from pressure groups and the American media, the electric utility industry has been able to control much of what happens in the EMF arena.

The industry, through its research arm, EPRI, and its lobbyists at the Edison Electric Institute, has used a number of tactics to protect its member companies from having to pay damages from cancer lawsuits and from having to mitigate high EMF exposures.

One of EPRI's favorite strategies is to not do followup studies of potentially productive research findings. Instead, institute staffers favor those avenues that might free the industry from EMF liabilities—for instance, as we have seen, when EPRI's Ebi and Kheifets promoted air pollution as the cause of childhood leukemia in an effort to move the spotlight away from EMFs.

Industry has also sabotaged work that could lead to a better understanding of EMF health effects. Hydro-Québec confiscated a data set assembled by Gilles Thériault of McGill University in Montreal after his epidemiological study of electric utility workers generated some of the most provocative, and incriminating, results. Thériault's work might have, if allowed to continue, provided a much needed breakthrough. None of Thériault's colleagues in the epidemiological and bioelectromagnetic communities uttered a word of protest.

But industry's most commonly used way to delay the day of reckoning was simply not to sponsor studies that might advance EMF health research. Time and time again, EPRI would say that some new promising findings would be followed up, only to later quietly put the projects on ice.

Instead of exposing how industry was hindering progress on EMF research, a number of leading members of the public health community have helped give EPRI an air of legitimacy. At one point in the early 1990s, half of EPRI's six-member EMF advisory committee were the deans of major public health schools: A.A. Afifi of UCLA, Pat Buffler of the University of California, Berkeley and Gil Omenn of the University of Washington.

Luckily, there have been some exceptions. The most important of these is David Carpenter of the New York Department of Health, who for a time was the dean of the State University of New York School of Public Health in Albany. (He is now at the University of Albany school of public health.) Carpenter ran the New York Power Line Project in the 1980s and for a decade devoted much of his professional life to EMFs. Though a skeptic at the outset, he changed his mind as the study results pointed to a health risk. By the time the project closed down, Carpenter had become a vocal advocate for protecting the public from EMF health risks.

Another public health official who made a difference is Raymond Neutra, who ran the California EMF project in the 1990s.

...As Public Health Officials Wait for Conclusive Proof

But Carpenter and Neutra are still very much in the minority and cannot alone make the needed changes in US EMF policies—and they of course have even less authority on the international level.

Those who can help the most—Linet at NCI, Portier at NIEHS, Repacholi at WHO, Tenforde at NCRP, Paolo Vecchia at ICNIRP, John Stather at the NRPB and Hilary Walker at the UK Department of Health—won't budge. (There have been some signs that the UK may adopt an ALARA policy for EMFs, but so far there has been no formal action.)

Far from pushing for precautionary policies, some government health agencies have actually adopted the industry's position. For example, the NIEHS has publicly dismissed the EMF-leukemia link. "There is no valid association between nearby power lines and any cancer—including childhood leukemia," it proclaimed on the Web after the IARC decision to classify EMFs as possible human carcinogens. A panel assembled by the NIEHS had reached the same conclusion as IARC two years earlier, but

even this did not sway NIEHS staffers who had already made up their minds that EMFs are not worth their attention.

Portier, who runs NIEHS' Environmental Toxicology Program, had pushed to upgrade the EMF threat at IARC to "probable" carcinogen but then forgot all about it back at home. It's as if Portier were playing some kind of intellectual parlor game—"Let me see if I can out-argue those who say EMFs are harmless"—but he seems to feel no moral responsibility to use his position of authority at NIEHS to protect the children.

Over at the WHO EMF project in Geneva, Repacholi did what he could to play down the IARC decision. (Note that IARC is part of the WHO.) With the help of Kheifets and Portier and a few others, he issued a booklet in six different languages that drew a parallel between EMF exposure and drinking a cup of coffee. Each had risks and benefits: While coffee may increase the risk of kidney cancer, it might also protect against colon cancer, he wrote. Repacholi neglected to offer a reason why EMFs could be good for you. No doubt because no one had yet come up with one. Even some of his WHO colleagues privately expressed embarrassment at Repacholi's double-talk.

And when, long before they were announced in London, Repacholi learned of the new Japanese findings that reaffirmed the EMF-childhood leukemia risk, he said nothing. Kheifets had been one of a select group invited to Tokyo last year to hear the news. She too kept her silence. (Kheifets is now at UCLA, though she is still working for Repacholi.)

The net result is that the WHO and NIEHS continue to endorse the current international exposure standards that do nothing to protect against a cancer risk. Repacholi, Kheifets and Portier are in effect telling mothers and fathers that their children could be safely exposed up to 1,000 mG (100 uT) all day, every day. By any measure, an irresponsible recommendation for those charged with protecting public health.

Their justification is the same as the industry's: the absence of conclusive proof. If that is the burden of proof, no one should expect a change in policy for a long, long time given that nearly all EMF research has stopped.

But there is no good reason to wait. A decision to apply precautionary policies would be a sound move—based on a large number of epidemiological studies of real children in real-world environments. However imperfect the epidemiology may be, human data should be more persuasive than exposure studies of rats or mice. And as David Gee of the European Environment Agency argued in London, health officials have a special duty to protect children, because they are among the most sensitive members of the population, they have the longest to live and they don't have the power to protect themselves.

In the WHO booklet, *Establishing a Dialogue on Risks from EMFs*, Repacholi writes that setting precautionary exposure limits would undermine "the credibility of the science." Similarly, in a recent e-mail to a Canadian activist who had berated him for consistently siding with industry, Repacholi wrote, "WHO bases its decisions on the science...if the science does not support your position, this is not my problem."

Sadly, Repacholi and the others have lost their way. It's not just about doing science, but also about protecting public health.